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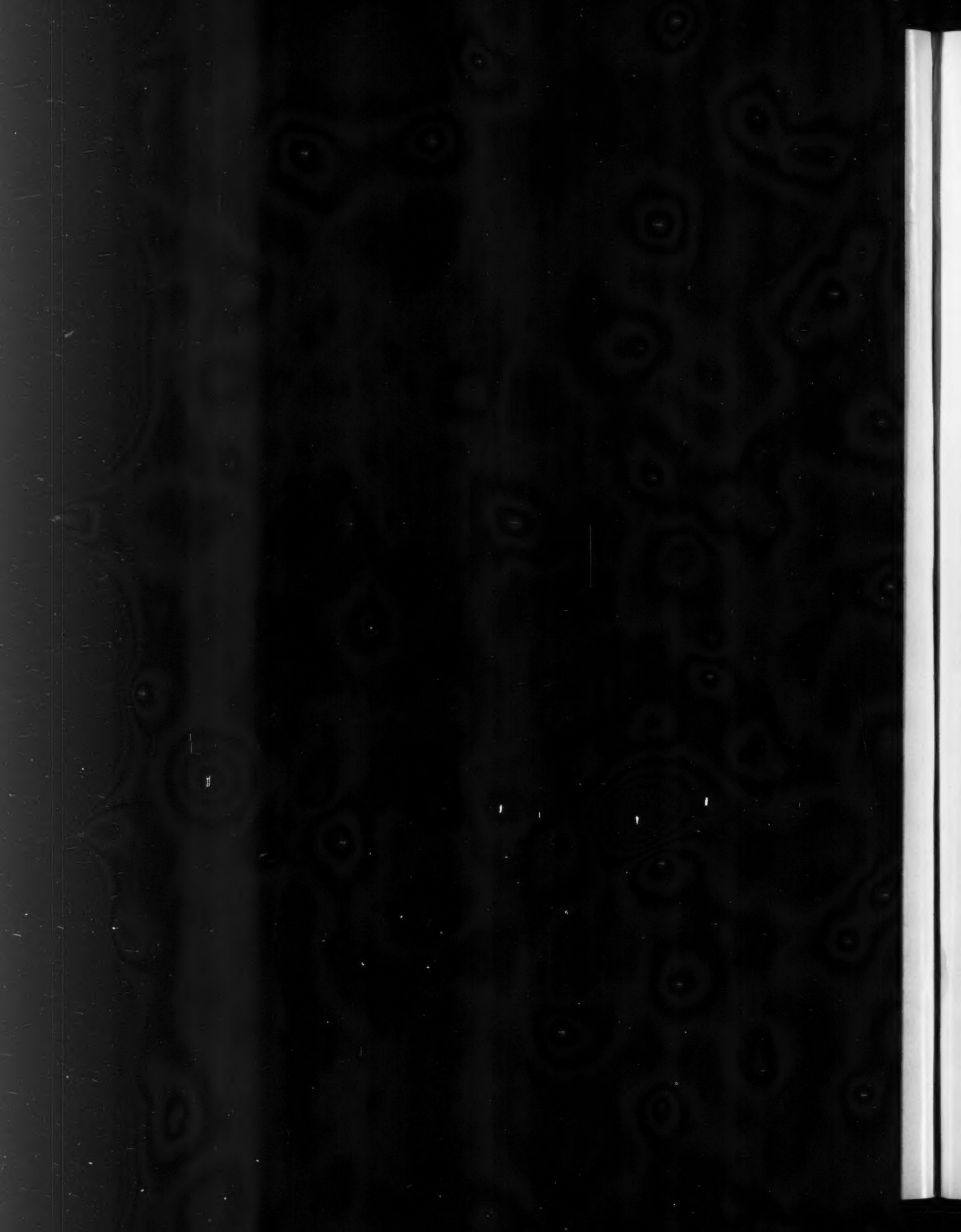

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SEATTLE'S CENTRAL FIRE ALARM SYSTEM

BY HOWARD JOSLYN.

(An excellent description is here given of Seattle's new automatic fire alarm system, reasons being given for the adoption of special features. Mr. Joslyn is city electrician at Seattle. A more extended account of his experience appears on the personal page in this issue.—The Editor.)

Seattle's Central Fire Alarm Office, Showing Instrument Pedestals and Boards.

The newly completed central fire alarm office of the City of Seattle is an example of what can be accomplished when the designer, in determining what will best answer the requirements, is not hampered by local conditions or old equipment. The principal requirements to be met were reliability, speed of signal transmission and economy of operation and maintenance.

The growth of Seattle in the past fifteen years has been so rapid that the automatic six and twelve circuit repeaters and switchboards purchased between 1898 and 1906 could not, with any reasonable additions, be expected to meet the needs of the service in the near future. The expansion of the city limits and topography of the territory has been such as to readily encourage the use of one or more fire alarm substations, in which the former automatic apparatus is and will be of advantage.

At present a large district lying north of the Lake Washington Canal is handled by a six circuit automatic office some three miles distant and connected to the main office by a signal circuit. This substation equipment has reached the limit of its capacity, and will soon be replaced by a twelve circuit office of the same type. In a few years the southern district will be of sufficient size to require a substation located about the same distance from the main office in an opposite direction, and the six circuit apparatus will then be used.

After extended study of central office equipment in other cities and discussion with engineers from the manufacturers of fire alarm apparatus, it was decided

to install a combined manual, semi-automatic and automatic office for forty box, ten joker or register lines and ten gong circuits, with extra switchboard capacity to handle appliances local to the main office. The automatic method of operation was emphasized as the one to be generally used for transmission of incoming box alarms over the joker circuits; and the equipment was required to work with perfect non-interference on signals coming in at a speed of two taps per second.

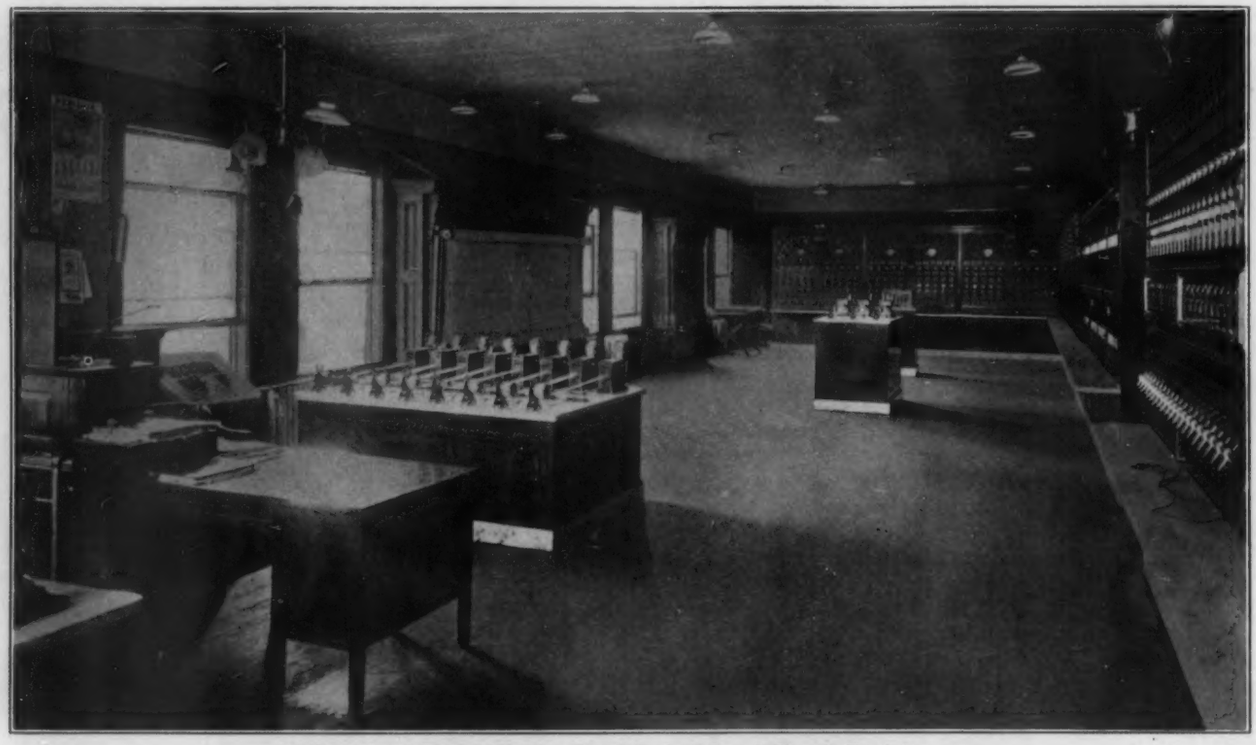
Preference was given to the closed circuit type of equipment throughout, on account of the immediate evidence given thereby of any interruption of current. The saving in battery plant by using a common battery for open joker and gong circuits was found to be inconsiderable, compared with cost of storage battery for individual closed circuits when proper estimate is made of time required for frequent testing by operators, or money invested in automatic appliances to determine conditions of open circuits.

For receiving apparatus on box circuits the five circuit puncturing register was selected as a unit, and nine of these instruments purchased. In case of trouble with any such register it can be removed and quickly replaced by a spare instrument, spring contacts being used in the pedestal for all connections. In addition to the eight main registers, three single punching registers are used with automatic time and date stamps as recording instruments, one for all outgoing joker signals, one to act as master register for all signals from boxes, and one to record all outgoing signals on gong lines. Some consideration was given to the use of six registers of ten circuits each, but the present instruments were at least 30 per cent less in first cost and were adaptable to locations more accessible to the operators.

Storage battery current is furnished through seven ten circuit combination storage and line switchboards with automatic control of the charging current. The circuits are brought in through two protector switchboards containing thirty-four circuits each. On the boards each circuit is protected by a pair of line fuses, a pair of lightning arresters and a pair of circuit breakers, all of which have been found to be reliable, an audible signal being given automatically when one of the circuit breakers opens.

The transmission switchboards consist of two twenty circuit main line relay boards with visual and audible indicating equipment; one ten circuit joker board carrying relays, pole changers, sounders, bells and light signals, and one ten circuit gong board with ammeters for each circuit, bells, working switches and multiple key. All of the boards are equipped with single key for each circuit, with multiple gang switches for changing apparatus to manual or automatic operation by a single motion under control of the operator. A gang switch is also provided for reversal of polarity on joker lines to send the signals over them by manual transmitter. The working switches instead of being mounted on separate boards are all carried on the above switchboards, almost directly in line with the instruments or apparatus which it may be necessary to temporarily cut out for repair or inspection. The switchboards are of slate and all frames and cabinets are of metal, finished in imitation of Circassian walnut. The bases of frames and pedestals are trimmed with white marble, and the same material is used for running table around the switchboard frames and for the heavy slabs on top of cabinets.

An automatic transmitter equipment is provided for the ten joker circuits, and a three dial manual trans-



Operators' Phone Boards, Signal Pedestal and Circuit Registers.

mitter is installed for transmission of signals over both joker and gong circuits. The manual transmitter is automatically wound, is equipped with both a right and a left main dial and an auxiliary dial with two speeds for fast and slow time, and has switches mounted on its base for connecting the instrument to any one or all of the joker and gong circuits. It can be used for the transmission of signals ranging from one to four figures each on either main dial, and when desired can transmit a preceding signal of one round of one to four figures on the auxiliary dial. Each main dial is independent of the other, so that while a signal is being transmitted from the right hand dial a separate signal can be set up on the left hand dial ready for immediate use, or vice versa.

Two separate private branch exchange telephone systems are provided for communication with engine houses, each station being equipped with instruments for the two circuits. One of these systems is used for tranmission of alarms only, it being made possible by special key to talk to all the engine houses at once, thereby greatly facilitating the transmission of telephone fire calls and special orders. The other system is used for general communication. The grouping of apparatus for quickness of handling by the operator was particularly studied, and his position in front of the telephone boards is conveniently located with reference to the manual transmitter and the transmission switchboards. Immediately at his right is a pedestal carrying a multiple key for single or general operation of telegraph signal and joker lines, and a telegraph key and telephone jack which can be plugged into any box, joker or gong circuit. By turning in his place the operator can read the incoming signals on the puncturing registers, and in the front panel of the pedestal carrying these registers are placed the individual and gang switches for throwing an incoming box signal automatically through the joker circuits when the office is set for manual operation, thereby saving the operator's time in making this change. The elimination of lost motion on part of the operator when handling an alarm has clearly shown the ability of one man to attend to the work, and much more, on his shift, but it is not considered advisable to leave him without assistance in case of trouble during the night watches. The saving effected by having only one operator during daylight hours represents the interest upon a large part of the cost of the office.

The central office and the engine houses are fully equipped for use of telegraph signals by key and sounder, but the telephone service has been found to be superior in all general communication except the reporting of apparatus returned to quarters. For communication between officers at a fire alarm box and the central office the telegraph code is valuable. When the office is set for automatic operation any incoming fire box signal will cause instant reversal of polarity on the joker lines and stop all communication by key and sounder.

The credit for manufacturing this equipment is due to the Gamewell Fire Alarm Telegraph Company, who were the successful bidders therefor. For general efficiency and for quickness and economy of operation the entire central office has no equal.

PRESENT VALUE OF PUBLIC UTILITY PROPERTIES.

BY W. G. VINCENT, JR.

It is common practice in cases involving the values of public utility properties to first determine either the original cost new of the existing properties or the cost to reproduce, or both, and second, to make an estimate of the accrued depreciation which is deducted from the cost new to obtain the so-called "present value." This present value, as defined, is often desired instead of the cost new, for the reason that all property which has a limited life in service is supposed to depreciate and not to be as valuable after it has been in service for some time as new property of the same class out of which a greater length of service may be obtained. The soundness of this theory in general cannot be questioned, although the application of it in determining value for certain purposes, and particularly in rate cases, is open to discussion.

A public utility property is made up of a large number of physical units varying in character and value, and the problem which presents itself in determining the present value of the physical property is one which involves the determining of the present value of a great many different items and different classes of property. It is obviously impossible to arrive at the present value by considering the total value of a property as if it were new, and immediately determining from this value new the present value of the whole property. The natural way which suggests itself, and which has generally been followed, is to consider first every individual item, and after grouping these items by classes, then to consider each class, and after determining its present value, the total of the present value for all classes is obtained as representing the present value of the property. For instance: if we have a property composed of a number of pieces of machinery, a number of poles, wire, etc., and we desire to determine the present value of this property, we would begin and consider each piece of machinery and determine its value, and adding the present values of the different pieces together, obtain the present value of the machinery as a whole. We would then take up the poles and determine the value of each and by adding the present value of the individual poles together, determine the present value of all poles, etc. Therefore, the accuracy of the total obtained is entirely and absolutely dependent on the accuracy and methods used in determining the present value of the individual items of equipment, and an analysis of these methods is necessary in order to determine this accuracy.

As the total present value is nothing more or less than the summation of the values of the individual pieces of equipment or property which go to make up the whole, the determination of the present value resolves itself into the determination of the present value of each item of equipment or property, and upon considering the variety in the items and the many different classes of property, we will find that a number of individual cases will arise where special conditions will influence the present value and which will require special treatment. In general, however, the property can be segregated into groups of structures of a similar character and of similar cost, which will constitute

by far the greater part of the value of any public utility property.

The methods employed in determining the present value of the various classes of property are:

First—Present value as determined by probable life and age.

Second—Present value as determined by condition.

It is the first of these methods that it is the purpose of the author to especially discuss.

After obtaining the total cost to reproduce of some class of property, such as the rails in a railway property, it is usual to then determine:

First—The probable life in service or the number of years which the rails will probably last and satisfactorily perform the service for which they were installed.

Second—The scrap value of the rails at the end of their probable life. This value will be the amount which can be obtained for the rails less the cost of moving and delivering them to the buyer.

Third—The average age of the rails at the time that the estimate is being made.

The depreciable or wearing value is obtained by deducting the scrap value from the cost value.

Up to this point there is a general agreement, that is, value new is assumed as cost new, and value at end of useful life is assumed as scrap value; however, when the value at any time during the useful life is to be determined we find various methods being employed, but the two most commonly accepted are the so-called "straight line" and "sinking fund" methods.

It must be recognized as a fundamental economic principle that the total sacrifice made by the investor who invests $10 in advance for some equipment which will render service for ten years is the original investment at compound interest for ten years. In cases where the investor is to be compensated for his sacrifice, it is obvious that the amount of his compensation at the end of ten years should amount to $14.80, as this is the sum to which $10 would compound in ten years, assuming an interest rate of 4 per cent.

There are a number of ways in which payments to the investor of certain sums can be made to accomplish this result. He can, for instance, be paid the $10 at the time of the installation as a purchase price, or he can be paid the $14.80 at the end of the ten years, or he can be paid certain sums annually which when placed at interest would amount to $14.80 at the end of ten years, or he can be paid other sums semi-annually, etc., etc.

In the particular problem that we are discussing, however, it is usual to deal in annual periods and it will be interesting to see what the results will be of the different methods of annual payments.

First, it will be necessary to analyze the amount of $14.80 which the investor should have at the end of ten years. Supposing for a moment that when the original equipment has served its useful life it will be desirable to replace it with a similar piece of equipment at the same cost. We immediately recognize then that the $14.80 is divisible into two parts.

First—$10, which the investor has received in the nature of a compensation for the using of his property, and,

Second—$4.80 which the investor has received as a compensation for the use of his money invested in the property.

Bearing in mind this division of the total sacrifice and that it is also desirable to make this division in each of the annual payments, we can tabulate the following:

First—The sum to be paid each year as interest to the investor for the use of his property during that year.

Second—The sums which should be paid during each year to the investor for the sacrifice in value of his property.

It is with the second of these that we are concerned at the present time. While the interest to be returned to the investor is of course essential, for the present it is sufficient to consider that the total amount to be returned to the investor in ten years is $4.80, as shown in column 3 of table No. 1 given below:

TABLE NO. 1.

			Depreciation.		Depreciation.		
Year.	Original Cost.	Interest Accumulated.	Annual Straight Line.	Accumulated at 4%.	Annual 4% Sinking Fund.	Accumulated.	Value at end of Year S. F. Basis.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	$10.00	....	$1.00	$1.00	$ .83	$ .83	$9.17
2	10.00	....	1.00	2.04	.83	1.70	8.30
3	10.00	....	1.00	3.12	.83	2.60	7.40
4	10.00	....	1.00	4.24	.83	3.53	4.47
5	10.00	....	1.00	5.41	.83	4.51	5.48
6	10.00	....	1.00	6.63	.83	5.52	4.48
7	10.00	....	1.00	7.89	.83	6.56	3.44
8	10.00	....	1.00	9.21	.83	7.66	2.34
9	10.00	....	1.00	10.58	.83	8.80	1.20
10	10.00	4.80	1.00	12.00	.83	10.00	....

In columns 4 and 5 of this table are given the annual amount of depreciation on the straight line basis, that is—considering that the depreciation each year is equal to the total depreciable value, divided by number of years that the equipment will remain in service, and the accumulated depreciation on this basis is the annual payments at 4 per cent interest compounded annually.

It will be noted that the total of the accumulated depreciation fund on this basis at the end of ten years would be $12.00, and that by adding this amount to the $4.80 the total amount returned to the investor would be $16.80, which is more than the total sacrifice of the investor. It is also obvious that the accumulated depreciation fund of $12.00 is more than would be necessary to replace the structure which originally cost $10.

In columns 6 and 7 are given the annual amounts that it would be necessary to put aside each year at 4 per cent compound interest and the accumulations from these payments at the end of each year, which it will be noted amounts to $10 in column 7 at the end of ten years. This amount added to the $4.80 of accumulated interest at the end of ten years exactly equals the total sacrifice of the investor and also seems to be properly segregated, as the $10 depreciation fund would cover the replacement of the structure.

Therefore, as far as the proper method of charging annual depreciation is concerned, it would appear obvious that the sinking fund method is correct where the fund is not disturbed. Now it also appears obvious that if the depreciation fund is to accumulate on the

sinking fund basis, the value of the property at any time is equal to the first cost less the depreciation fund at that time. For instance, should any question arise at the end of any year the value of the property would be that shown in column 8.

Now if we assume the figures in column 7 to be correct as to the proper method of accumulating a depreciation reserve, but do not admit that the deduction of this reserve from the first cost is a proper method of obtaining the present value and insist that the straight line method is the proper one, we would find that at the end of five years we would have a depreciation reserve of $4.51 and a present value of $5, or the sum of the present value and the depreciation reserve would fall 48 cents short of equalling the cost new.

It will be interesting to work out one or two specific cases, applying the two methods suggested and see what the results will be.

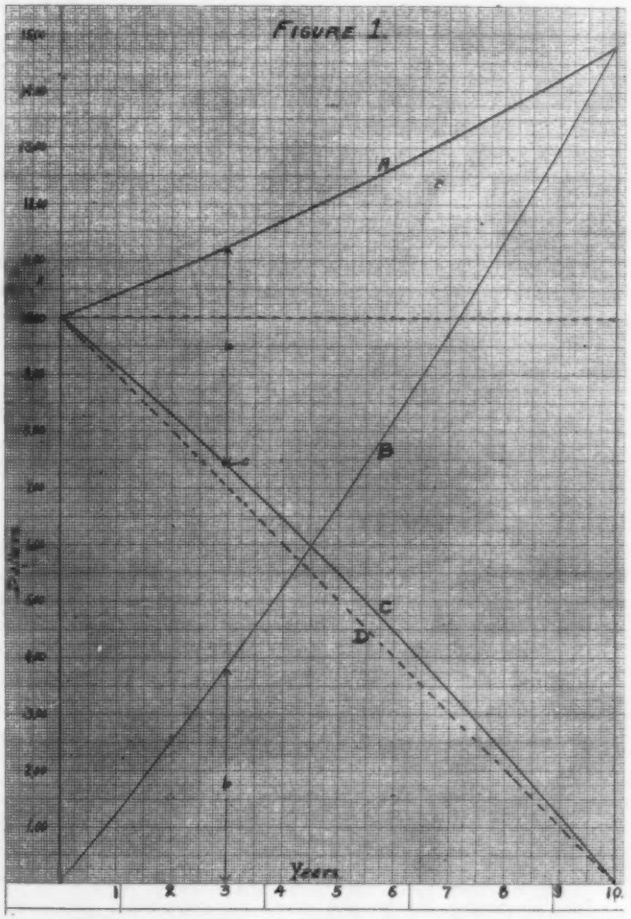
Case 1.—Assume that a tenant "A" takes a lease on a store for ten years for $1000 cash in advance, and another tenant "B" leases the store next door, similar in every respect, for $123 per year for ten years, payments to be made at the end of each year. If the rate of interest is 4 per cent, the terms of the leases are similar in the long run, for if the landlord puts "A's" $1000 in a savings bank at 4 per cent and deposits "B's" payments when made in another bank at the end of ten years, each account would amount to $1480.

Now at the end of four years "A" decides to retire from business and "B," desiring to enlarge his business, agrees to buy "A's" lease for what it is worth. As the terms of the leases are similar as to total cost of the service each is obtaining and "A's" lease is fully paid up, the value of the lease can be expressed in two ways:

First—Some amount which when added to "B's" sacrifice and both put at compound interest for the remaining six years, will equal	**$1480.00**
"B's" sacrifice to date is	**543.00**
The amount which will equal $1480.00 in six years is	**1170.00**
The difference, or the amount which "B" should pay to "A", or the value of the lease is	**627.00**
Second—"A's" sacrifice to date, after he has received the value of the lease from "B," should equal "B's" sacrifice to date for the store he leased on annual payments, or the value of the lease is the difference between the sacrifice to date of "A" and the sacrifice to date of "B."	
"A's" sacrifice to date has been $1000.00 at 4% compound interest for four years, or	**$1170.00**
"B's" sacfifice to date has been (as above)	**543.00**
The difference, or the value of the lease is	**627.00**

Case II.—The service rendered by a pole which costs $10 and will give service for ten years involves an economic sacrifice of $10 at compound interest for ten years, and if we assume an interest rate of 4 per cent this sacrifice in ten years will amount to $14.80. Now if this same service could be purchased and paid for in equal annual payments the purchaser could afford to pay for the service some amount, which with compound interest on the payments from the time of each payment to the end of the ten years would equal $14.80. This annual amount would be $1.23. In other words, the same economic sacrifice would be made by investing $10 in advance for ten years of service as would be involved by paying $1.23 at the end of each year for the same service for ten years.

Now if we assume two similar structures, one of which "A" has been installed at a cost of $10 and the other "B" is leased for ten years at $1.23 (neglecting for the moment the question of replacing the structure) at the end of any period of say six years the owner of structure "A" desires to know what the cost of the service rendered by the structure to him has been. As the total cost of both structures will be the same at the end of ten years, he computes the cost to date of the leased structure by setting down his annual payments and computing the compound interest on them up to date. Now if he computes the cost to date of structure "A" and deducts the cost to date of structure "B" he will obtain an amount which will represent what it has cost him to date to provide the service for the next four years, or the present value of the structure at the end of six years. This amount will not be the total cost of service for the next four years any more than the original ten dollars was the total cost for ten years.



This may be shown graphically as in Fig. 1 where the curve A is plotted to represent the total cost to the investor each year from one to ten years for the structure installed at a cost of $10. Curve B represents the total cost for the leased structure. Curve C is obtained each year by deducting the ordinate of

curve B from curve A. The sums from which these curves were plotted are given in Table 2.

The result of this chart is significant in that curve C is a 4 per cent sinking fund curve.

TABLE NO. 2.

Years.	Total Cost. Structure Costing $10.00. (Curve A)	Leased Structure. (Curve B)	Present Value A-B. (Curve C)
0	$10.00	....	....
1	10.40	$1.23	$9.17
2	10.81	2.51	8.30
3	11.25	3.85	7.40
4	11.70	5.24	6.46
5	12.17	6.68	5.49
6	12.65	8.18	4.47
7	13.16	9.73	3.43
8	13.69	11.36	2.33
9	14.23	13.03	1.20
10	14.80	14.80	....

Case III.—Assume a public utility property is to be sold from "A" to "B" and they both agree on all of the terms of the sale and on the fair value of all of the property and its business, **except** the sale price for the depreciable physical property, but they do agree on the following:

Cost to reproduce depreciable property.....$110,000.00
Weighted average probable life ..... 25 years
Weighted average age ..... 10 years
Scrap value .....$ 10,000.00
No depreciation fund has been maintained.

"B", the buyer, insists that as the property on the average will last twenty-five years and it is ten years old with a junk value of $10,000 it is worth but 15/25th of $100,000 plus $10,000, or $70,000.

"A," the seller, insists that the property is worth more than $70,000 and submits to "B" his estimate, as follows:

First—If the depreciable property were all new it would be worth $110,000.00 and "B" agrees that if the property were new he would pay $110,000.00.

Second—A fair interest rate for a conservative investment is at least 4%.

Third—If for the last ten years "A" had put aside $2401.20 annually at 4%, he would now have a depreciation reserve of $28,828.80, and if $2401.20 is added to the fund annually for the next fifteen years, the fund will then amount to $100,000.00, which, with the junk value of $10,000.00, will replace the property at the end of its life.

Fourth—If the depreciation fund of $28,828.80 were available the property and the fund together would be worth $110,000.00; therefore, without the fund the property is worth $28,828.80 less than what it would be worth if the fund had been maintained, or ($110,000.00 — $28,828.80) = $81,171.20.

It would seem that "A's" estimate is based on sound economic principles from his point of view, but now let us see if they are sound from "B's" point of view. Suppose "B" had two courses open to him:

First—Buy "A's" property for $81,171.20.

Second—Buy another property similar in every respect, but new, for $110,000.

If he purchased the new property and put $2401.20 aside annually he would have accumulated sufficient money at the end of twenty-five years to replace the entire property.

If "B" purchased "A's" property for $81,171.20 and started a sinking fund with the balance of his $110,000, or $28,828.80, and then added $2401.20 annually, he would have at the end of fifteen years sufficient money in his fund to replace the entire property, or he would be as well off as if he had bought the new property. Therefore, "A's" estimate must be accepted as sound.

However, "B's" estimate of $70,000 seemed to be based on a sound premise and one of the estimates is necessarily unsound. If we analyze the basis of "B's" estimate we find that it is based on this premise:

The value of any depreciable property is that proportion of its original cost that the remaining life is of its total life, with proper allowance for scrap value. This premise is fundamentally unsound, as it considers first cost and not total cost.

The Wisconsin Railroad Commission in the Beloit case said:

"It seems fairly certain, in view of the facts, that if we are to consider the value of a unit of equipment as installed and in operation, the depreciation will in general occur more slowly during the earlier than during the later years of its life, and that in general the value at all times will be somewhat above the straight line drawn from cost of reproduction to scrap value. It is, however, much easier to arrive at this conclusion than it is to indicate the course actually followed by the decrease in value. It is probable that the fairest representation of this course is the sinking fund curve. Whether a 4 per cent, 3 per cent or other curve is the closest to a fair and reasonable rate depends largely upon other factors, which can perhaps be closely ascertained only by careful investigations and clear knowledge of the surrounding conditions. Where proper depreciation curves have been kept in the past, the present or existing value of a property, as determined by inventory, inspection and appraisal, plus the depreciation reserve should theoretically equal the cost new of that property.

"There is, of course, no actual connection between the rate of depreciation of equipment and the rate at which money accumulates under a given rate of compound interest. The progress of depreciation must be assumed in any case. If we are to follow the proposition that it follows a curve instead of a straight line, it seems fair to assume that this curved line has a certain general form, and it would seem reasonable to assume that the 4 per cent sinking fund curve fairly represents the progress of depreciation under average conditions."

It would appear from the above and particularly from the sentence: "There is, of course, no actual relation between the rate of depreciation of equipment and the rate at which money accumulates under a given rate of compound interest" that although the commission realized that the sinking fund method was about right, they did not realize that **there is** an actual relation between depreciation of equipment and the rate at which money accumulates where such depreciation is dependent solely upon the lapse of time.

The fallacy in the "straight line" method of determining present value lies in the failure of this method to differentiate between first cost and total cost and in incorrectly assuming that the cost of property paid for at the beginning of its life is the same as if it were paid for in equal payments throughout its life. It seems hardly necessary to point out that this assumption is directly opposed to all established economic laws governing the payment of interest, dis counts, etc.

The method often employed of determining present value by observed condition is one which it is necessary to employ in dealing with certain classes of property, but it has the very serious drawback of

being based entirely upon personal opinion based upon the experience and judgment of the observer.

The Wisconsin Railroad Commission in the Beloit case in discussing present value said:

"Many appraisers oppose the use of a curve of any kind or form and rely upon the judgment of an expert as based upon the actual inspection of the equipment under consideration. Since, however, a great deal of equipment cannot be adequately examined in service, it is necessary to rely very largely upon age, and in such cases the appraiser actually depreciates upon an actual or mental curve which is based upon the more or less definite life table which is the result of his experience. More consistent and fairer results would appear to be obtained by the use of a life table compiled from the experience of a large number of experts in connection with a definite curve, even if the basis for the use of such curve rests, to some extent, upon assumptions which are more or less difficult to justify with exactness."

Where present value is desired the most accurate results will be obtained by a combination of the "Observed" and "Sinking Fund" methods, applying to each item or group of items the method which suggests itself as best adapted to give the fairest results in each case. It is only necessary to consider some of the classes of property which comprise a public utility to realize the limitations of either the observed or the average age method applied consistently to the whole property, and the result is that most appraisers make use of a combination of the two methods to arrive at a general result which they consider to be reasonable. The tendency is, however, to rely too much upon the average age method, as this method is apparently more accurate, inasmuch as it eliminates to a large degree the personal equation, and this tendency results in an application of the average age theory of depreciation in a great many cases to classes of property where the age has absolutely no relation to depreciation.

It should be borne in mind in applying either of the above methods that the average age method can only be used in determining that element of depreciation which is due to wear and tear, action of the elements and ravages of time and should in no sense be employed as a measure of the other elements in depreciations, such as obsolescence and inadequacy. Consideration should, of course, be given to obsolescence, inadequacy, etc., in determining present value, but the proper deduction which should be made on account of these elements of depreciation is entirely a question of efficiency and the functional relation of the equipment to the service which it is expected to supply.

In the above the sum of the present value and the accrued depreciation, that is the theoretical sinking fund, has been assumed as at all times being equal to original cost. This is only theoretically true where the depreciation fund is based upon the elements of depreciation which are related to the age of the property and is in no sense true of those elements introduced by other considerations than the age. In other words; in computing the annual depreciation which should be set aside for any class of property all of the elements which contribute to the depreciation, not only which have occurred, but which will possibly occur in the future, should be considered, but in determining the present value only the depreciation which has actually occurred should be taken into consideration.

Consider, for instance, a concrete structure, such as a dam. Now at the end of any limited number of years, as five, ten or fifteen, the physical condition of this structure will in all probability be as good as it was the day that it was installed and no deduction should be made for the age of the structure in considering the present value, but in computing the annual allowances for depreciation of the property of which this dam is a part, some allowance should be made annually for the amortization of this structure, as it certainly cannot be expected that the structure will be as useful forever as it is at the time being considered.

The engineer has a position of grave responsibility to fill in the development of correct methods of valuing property and is perhaps to some extent responsible for many decisions which violate economic laws. He should, therefore, bend his energies to a careful analysis of the problems involved and work them out by considering all of the facts and principles which enter into each case.

In giving his views on the question of present value, the author has had in mind the importance of this and many other questions involved in valuations, and that, notwithstanding the amount of thought and discussion that is being given to this subject, there are wide differences in the methods in use. Believing that one reason for this condition is that the discussions have been too general and that in an effort to correlate the various phases of valuations not enough attention has been paid to the details of each problem, the author has tried to bring out for discussion his ideas on one question and in doing so has purposely omitted all matters not essential to that question.

Electrical gas purification by the Cottrell precipitation process has proved a success in removing tar from illuminating and producer gas. This is on the same principle that has been applied in the precipitation of smelter fume and cement dust by high tension electric discharges, except that alternating current is used. This electro-mechanical action condenses a dense tar mist into a few large drops, which can be readily removed by the ordinary tar extractor. A commercial plant has been in satisfactory operation since January, 1914, at the Detroit factory of the Ford Motor Company, where the producer gas is detarred.

The total heating value of a gas, as defined by the U. S. Bureau of Standards and expressed in the English system of units, is the number of British thermal units produced by the combustion, at constant pressure, of the amount of the gas which would occupy a volume of 1 cubic foot at a temperature of 60 degrees F, if saturated with water vapor, and under a pressure equivalent to that of 30 inches of mercury at 32 degrees F, and under standard gravity, with air of the same temperature and pressure as the gas, when the products of combustion are cooled to the initial temperature of gas and air and when the water formed by combustion is condensed to the liquid state.

ELECTRIC DISTRIBUTION

STANDARDS IN SAN DIEGO.

G—Motors.

BY L. M. KLAUBER.

[Continued.]

Section G covers the following topics:

G 10—Service Wires.
G 20—Fuses and Wiring Data.
G 30—Weights and Pulley Data—G. E. Motors.
G 40—Starting Compensators—G. E. Motors.
G 50—Motor Belts.

Since the San Diego Company does not ordinarily engage in either the sale or installation of motors, the information given is only such as is of assistance to troublemen handling consumers' complaints. Naturally, only the voltages found on the company's lines are considered.

G 10. Service Wires for Motors

G 10.1 Service Wires for Motors.

H.P. of Motor.	Size of Service. Single Phase. 110-V.	220-V.	Three Phase. 220-V.	440-V.	500 D.C.
1	8	8	...	...	8
2	8	8	...	...	8
3	6	8	8	...	8
5	2	6	8	8	8
7½	1/0	4	8	8	8
10	2/0	2	8	8	8
15	...	...	6	8	8
20	...	...	4	8	8
25	...	...	2	8	6
30	...	...	2	6	4
35	...	...	1/0	6	4
40	...	...	1/0	4	2
50	...	...	1/0	2	2
75	...	...	3/0	1/0	1/0
100	...	...	300,000	1/0	3/0

The above figures are for overhead services using W.P. wire. In the case of single phase motors the size wire is selected by taking that size which has a continuous carrying capacity 100 per cent in excess of full load current. In the case of three phase and D.C. motors the carrying capacity of the wire is 50 per cent in excess of full load. Where underground services are run necessitating R. C. wire, do not use the above tables, but use the tables given on sheets G 20.1 to G 20.4 inclusive.

G 20.1 Single Phase Motors. 110 Volts—60 Cycles.

Horse Power.	Full Load Current in Amperes.	Size of Wire, B. & S. Gauge.	Size of Switch, in Amperes.	Size of Fuses, in Amperes.	Size of Conduit.
¼	4.5	14	30	10	½
½	7.5	12	30	15	¾
1	13	10	30	25	¾
2	24	8	60	50	1
3	35	6	100	75	1
4	45	4	100	100	1¼
5	55	2	100	100	1½
7½	78	1/0	200	150	2
10	104	2/0	200	200	2

200 Volts—60 Cycles

¼	2.5	14	30	6	½
½	3.5	12	30	10	¾
1	6	12	30	14	¾
2	12	10	30	25	¾
3	17	10	60	35	¾
4	22	8	60	50	1
5	27	6	60	60	1
7½	40	4	100	75	1¼
10	53	2	200	125	1½

G 20.2 Three Phase Motors. 220 Volts—60 Cycles.

Horse Power.	Full Load Current, in Amperes.	Size of Wire, B. & S. Gauge.	Size of Switch, in Amperes.	Size of Starting Fuses, in Amperes.	Size of Running Fuses, in Amperes.	Size of Conduit.
¼	1	14	30		3	¾
½	2	14	30		6	¾
1	3	12	30		10	¾
2	6	12	30		15	¾
3	9	12	30		20	¾
4	11	12	30		25	¾
5	15	10	30		30	1
7½	21	8	60	40	25	1
10	27	6	60	60	35	1¼
15	39	4	100	75	50	1½
20	51	2	100	100	65	2
25	63	2	200	125	75	2
30	76	0	200	150	100	2
35	88	00	200	200	125	2
40	100	000	200	200	125	2½
50	124	0000	300	250	150	2½
75	184	300,000	400	400	250	3
100	249	500,000	400	500	300	3½

G 20. Fuses and Wiring Data. The information contained in the handbook consists of the accompanying schedules. These are similar to those found in the Underwriters' Tables, except that standard sizes of switches and fuses have been substituted.

G. 30. Weights and Pulley Data—G. E. Motors. The data contained in this section is often of assistance in emergency installations where existing line shafting necessitates special pulleys.

G 20.3 Three Phase Motors. 440 Volts—60 Cycles.

Horse Power.	Full Load Current in Amperes.	Size of Wire, B. & S. Gauge.	Size of Switch, in Amperes.	Size of Starting Fuses, in Amperes.	Size of Running Fuses, in Amperes.	Size of Conduit.
1	1.6	14	30	5	3	¾
2	3.6	14	30	10	5	¾
3	4.3	12	30	10	10	¾
4	5.5	12	30	15	10	¾
5	6.5	12	30	15	10	¾
7½	10	12	30	20	15	¾
10	13	10	30	30	20	1
15	20	8	60	40	30	1
20	25	6	60	50	35	1¼
25	31	6	100	75	40	1¼
30	38	4	100	75	50	1½
35	43	4	100	100	60	1½
40	49	2	100	100	60	2
50	61	2	200	150	75	2
75	93	00	200	200	150	2
100	122	000	300	250	150	2½
150	182	300,000	400	400	250	3
200	240	400,000	500	500	300	3
250	300	500,000	600	600	400	3½

G 20.4 Direct Current Motors. 500 Volts.

Horse Power.	Full Load Current, in Amperes.	Size of Wire, B. & S. Gauge.	Size of Switch, in Amperes.	Size of Fuses, in Amperes.	Size of Conduit.
1	2	14	30	3	½
2	4	14	30	5	½
3	6	14	30	10	½
5	9	14	30	15	½
7½	13	12	30	20	¾
10	18	10	30	30	¾
15	26	8	60	40	1
20	35	6	60	60	1
25	44	4	100	75	1¼
30	50	4	100	75	1¼
35	58	4	100	100	1¼
40	66	2	100	100	1½
50	83	2	200	150	1½
60	99	0	200	150	2
75	124	00	200	200	2
100	166	0000	300	250	2
125	207	0000	300	300	2
150	248	300,000	400	400	2½
175	290	500,000	500	500	3
200	331	500,000	500	500	3
250	413	750,000	600	600	3½

G 30.1 G. E. SQUIRREL CAGE INDUCTION MOTORS.

Standard Pulley Data and Weights. Three Phase, 220 or 440 Volts.

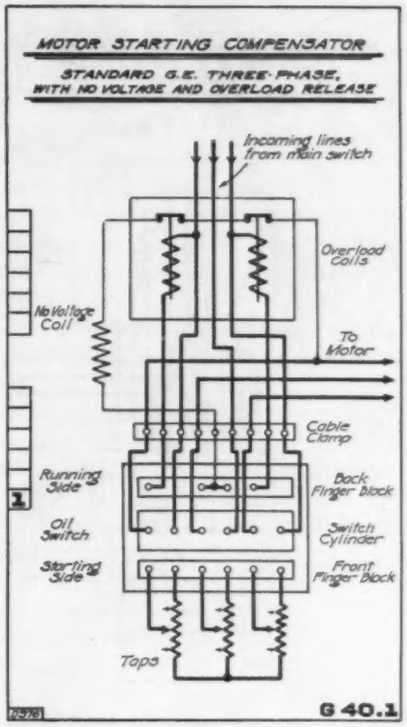
Horse Power.	Syn. Speed.	Full Load Speed.	Net Weight With Base.	Standard Pulley. Dia.	Face.	Bore.	Min. Pulley. Dia.	Face.
½	1800	1690	55	3½	2½	¾	2	1¼
½	1200	1120	85	3½	2½	¾	2	1¾
¾	1200	1130	100	4½	2½	1	2½	2
1	1800	1700	85	3½	2½	¾	2½	1¾
1	1200	1130	110	4½	2½	1	2½	2½
1½	1200	1130	125	4½	2½	1	3	2¾
2	1800	1700	125	4½	2½	1	3	2½
2	1200	1130	150	4½	3½	1	3	3½
3	1800	1720	150	4½	3½	1	3	3½
3	1200	1135	195	4½	4½	1¼	3½	4½
5	1800	1730	195	4½	4½	1⅛	3½	5¼
5	1200	1140	290	5½	4½	1⅜	3¾	6¾
5	900	855	380	7	5	1⅜	4½	7¼
7½	1800	1740	290	5½	4½	1⅜	3¾	6¾
7½	1200	1150	380	7	5	1⅜	4½	7¾
7½	900	860	560	8	5	1⅜	5	8
10	1800	1740	380	7	5	1⅜	4	7¾
10	1200	1140	560	8	5	1⅞	5	8
10	900	865	610	8	6	1⅜	5½	10
15	1800	1740	390	7	5	1⅜	6	7¾
15	1200	1140	610	8	6	1⅞	6	10
15	900	865	885	10	7	2⅛	6½	13
15	720	690	955	10	8	2⅛	9	9

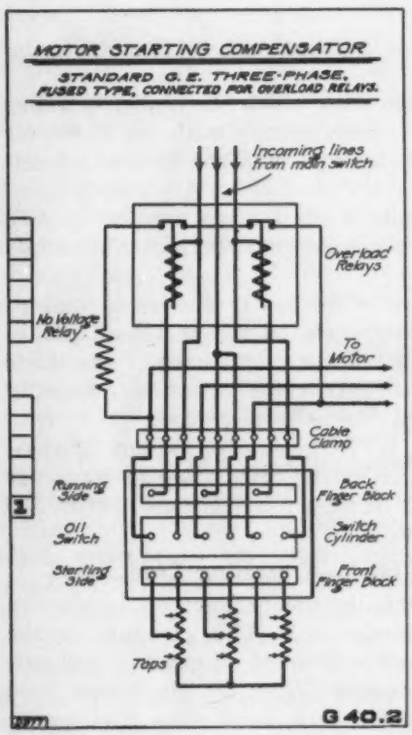
G. E. SQUIRREL INDUCTION MOTORS.
Standard Pulley Data and Weights.
Three Phase, 220 or 440 Volts.

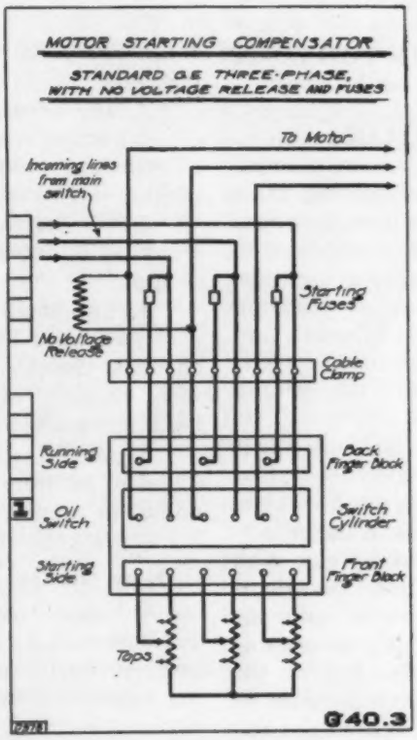
Horse Power.	Sym. Speed.	Full Load Speed.	Net Weight With Base.	Standard Pulley. Dia.	Face.	Bore.	Min. Pulley. Face.	Dia.
20	1800	1740	610	8	6	1⅞	7	9
20	1200	1150	885	10	7	2⅛	6½	13
20	900	865	955	10	8	2⅛	9	10
20	600	565	1425	13	10	2⅜	9	11
25	1200	1150	955	10	8	2⅛	8	13
25	900	865	1240	10	10	2⅜	9	10
25	720	680	1425	13	10	2⅜	9½	11
25	600	575	1425	13	10	2⅜	11	11
35	1200	1150	1240	10	10	2⅜	9	10
35	900	860	1425	13	10	2⅜	10	11
35	720	680	1425	13	10	2⅜	12½	11
35	600	575	1740	13	13	2¾	11	15
50	900	865	1740	13	13	2¾	10½	15
50	720	695	2240	15	15	3¼	10	17
50	600	575	2240	15	15	3¼	12	17
50	514	490	2950	16	17	3½	13½	17
75	900	865	2240	15	15	3¼	12	17
75	720	695	2950	16	17	3½	14½	19
75	514	490	3535	21	19	4	16	21
100	720	690	3535	21	19	4	15½	21
100	600	575	3535	21	19	4	17	23
100	450	425	5250	28	23	4½	18	23
150	720	695	4105	24	21	4½	18	25½
150	600	575	5250	28	23	4½	19½	25½
150	450	425	6090	32	25½	5	21	29½
150	400	375	6090	32	25½	5	23½	29½
200	600	580	6090	32	25½	5	21	29½

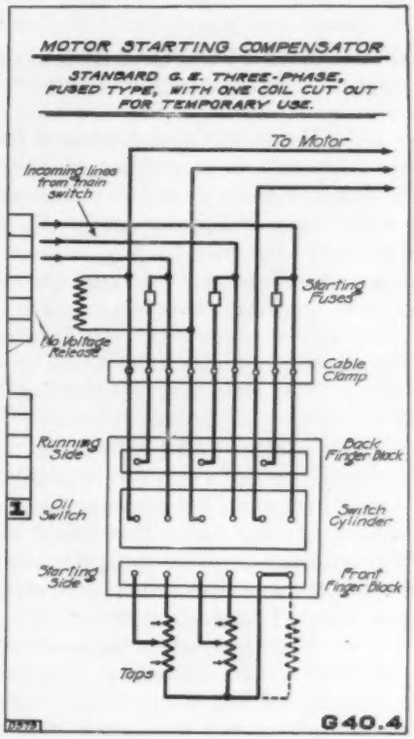
G 30.3—G. E. SQUIRREL CAGE INDUCTION MOTORS.
Standard Pulley Data and Weights.
Three Phase, 2200 Volts.

Horse Power.	Sym. Speed.	Full Load Speed.	Net Weight With Base.	Standard Pulley. Diameter.	Face.	Bore.	Pulley. Minimum Diameter.	Face.
20	1200	1150	885	10	7	2⅛	6½	13
20	900	870	955	10	8	2⅛	9	10
25	1200	1150	955	10	8	2⅛	8	13
25	900	865	1240	10	10	2⅜	9	10
25	720	690	1425	13	10	2⅜	9½	11
35	1200	1150	1240	10	10	2⅜	9	10
35	900	850	1425	13	10	2⅜	10	11
50	900	865	1740	13	13	2¾	10½	15
50	514	485	2950	16	17	3½	13½	17
75	900	865	2240	15	15	3¼	12	17
75	514	490	3535	21	19	4	16	21
100	720	690	3535	21	19	4	15½	21
100	450	430	5250	28	23	4½	18	23
150	720	700	4105	24	21	4½	18	25½
150	450	430	6090	32	25½	5	21	29½
200	600	575	6090	32	25½	5	21	29½





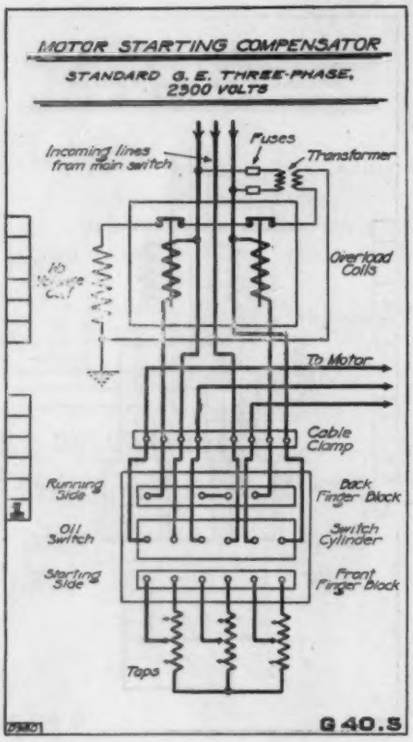




The heat unit has not been defined by any international congress, but is usually taken as the quantity of heat required to raise the temperature of unit mass of water one degree, the original water temperature being specified. The calorie is the quantity of heat required to raise the temperature of 1 gram of water 1 degree at 15 degrees, C. The British thermal unit (B.t.u) is the quantity of heat to raise the temperature of 1 pound of water 1 degree at 59 degrees F.

Potash from feldspar is the subject of a series of experiments now being conducted in the Kingston district of Ontario, Canada.

The constitutionality of the Oregon water code has been upheld by the Federal District Court in the case of the Pacific Livestock Company against the Oregon Water Board in the determination of the Silvers River water rights.



G 50.1 —BELTS FOR MOTORS

Size of Belt:

Determine the width of a belt required to transmit a given h.p. from the following:

$$\text{Width} = \frac{\text{H.P.} \times \text{M}}{\text{Speed}}$$

The speed should be expressed in feet per minute.

Values of M are as follows:

For single ply leather	M = 800
For double ply leather	M = 500
For canvas belts 4 ply	M = 800
For canvas belts 6 ply	M = 530
For canvas belts 8 ply	M = 460
For canvas belts 10 ply	M = 400
For canvas belts 12 ply	M = 355

Ply:

Single ply belts should be used up to about 6 in. in width; from 6 to 20 in. use two ply; from 20 to 40 in. use three ply.

Distance Between Centers:

Pulley centers should not be less than 3 times the sum of the diameters of the pulleys. Better results will be secured if the distance be made 4 or 5 times the sum of the diameters.

Width of Belt:

The pulley face should exceed the width of belt, as follows:

1 in. to 2 in. by ¼ in.
2 in. to 5 in. by ½ in.
5 in. to 10 in. by ¾ in.
10 in. to 24 in. by 1 in.
24 in. to 36 in. by 1½ in.

Speed:

Maximum belt speed should not exceed 5000 ft. per minute.

$$\text{Belt speed} = \frac{\pi \times \text{dia.} \times \text{R.P.M.}}{12}$$

Speed Reductions.

The following belt reductions should not be exceeded:

H.P. Motor.	Reductions.
1/15	15 — 1
1	10 — 1
5	8 — 1
10	6 — 1
20	5 — 1
50	4 — 1

Length of Belt:

The length of belt required is 1.57 (D + d) + 2L.

L = Distance between pulley centers.

The length of belt in a roll is found by adding the diameters of the hole and the roll, in inches; then multiplying by the number of coils in the roll times 131. The answer will be in feet.

Side:

The grain or hair side of a belt should run next the pulley.

Laps:

The motion of driving should be with the laps.

[To be continued.]

STANDARDS FOR GAS SERVICE IN THE WEST

BY R. S. McBRIDE.

[Concluded.]

Heating Value Standard for Oil Gas.

Although in a number of states considerable attention has been given to standards of heating value for coal gas and water gas, little attention has been given until recently by any state or city authorities to this question as applied to oil gas. Applying the same general methods that have been used in studying water gas and coal gas conditions, the Bureau undertook the consideration of oil gas conditions. It is desirable to give only a brief outline of the method followed and of the conclusions.

The first problem considered was how oil gas is made; particular attention was given to the question of manufacturing limitations, i. e., as to what was the highest heating value that could be made under certain conditions; what difficulties would be met with the higher and the lower qualities under consideration, etc. The gas produced is somewhat different in some of its properties from either coal gas or water gas; and it was therefore also considered from the standpoint of the user. The uniformity possible in supplying this gas was considered, as well as the relative costs for different qualities. As in the case of water gas and coal gas, one of the most important considerations was found to be the effect of changing quality upon sales. This factor is not only important, but it is also probably the most difficult one upon which to get any thoroughly satisfactory information.

The data which has been placed at the disposal of the Bureau by various companies has led to several conclusions:

1. Oil gas companies can make a gas of over 600 B.t.u. per cubic foot without serious manufacturing difficulty.

2. The advantage with which the higher qualities of oil gas are made varies greatly with the character of generator used, as well as with the kind of oil employed.

3. Oil gas cannot be made of as uniform quality from day to day as is possible with certain other kinds of gas.

4. The character of oil gas is similar to that of coal gas, both in usefulness to the customer and in chemical composition, except in the case of gas made more recently in San Francisco which is unusually high in saturated hydro-carbons.

5. And finally, it is generally, if not always, found to be more economical, calculating in B.t.u. per dollar, to supply gas of higher heating value than 550 B.t.u. per cubic foot.

How Oil Gas is Made—Operating Limitations.

Oil gas is essentially the product of destructive distillation of hydrocarbon oil. This accounts for the great similarity in composition of oil gas and coal gas, the former being produced from oil, the latter from bituminous coal, under such conditions that somewhat similar reactions occur. The generating machinery used for production of oil gas resembles markedly the water gas machinery and the process is also somewhat similar as it is carried out in alternate heating and gas making periods. However, the chemical processes involved and the effect of various factors are so different from those found in the case of water gas that it is undesirable to make comparisons with the latter when considering oil gas. Comparison may be made with the carburetting process used in water

gas manufacture, but even this has led to some misunderstandings.

Several processes have been devised for manufacturing oil gas. It is only possible to review briefly the principal operating methods and to point out those manufacturing limitations which must be considered in the adoption of a standard for oil gas service.

There are three distinct processes in use for the manufacture of oil gas: (1) the "straight-shot process" in which a single-shell machine is utilized; (2) the two-shell process in which the second shell is used only to conserve heat, no gas being made in it; and (3) the two-shell process in which gas is made in both shells.

There are many variations in each of these processes; for example, the heating oil may be introduced at the top or at the bottom of the shells; the making oil may be introduced at the same point as the heating oil or at the opposite end of the machine; gas may be taken off at one end of one shell or at the side of the larger of the two; a secondary blast may be used or not. These and numerous other variations in the process make it difficult to compare operating efficiencies in one city with those obtained in another.

The temperature maintained in the generator varies with the character of oil employed and with the quality of gas which is to be made. In general, a higher temperature produces a larger quantity of poorer gas; and, within limits, the converse is true that the lower the temperature at which the generator can be operated the higher will be the quality of the gas. This condition results from the fact that the decomposition of the oil into gas is a progressive process.

The significance of this successive decomposition is apparent if we consider that a specification of a certain heating value for the gas will necessitate that the generator be operated at such temperature as to produce gas at least of the richness specified. The standard fixed is therefore a determining factor in controlling the works operation. Moreover, if the quality be fixed too high it will be found that certain difficulties of operation are introduced because of the low temperature which must be maintained in the generator. For example, when operating at a low temperature a smaller amount of lamp black may be made; but this as produced is mixed with more or less of the difficultly removable tar and the resulting tar and lamp black mixture is difficult to handle. This trouble is met particularly in the cases of some of the straight-shot machines. Another difficulty met under these conditions is the larger amount of carbon which is deposited in the generator and the resulting increase in the frequency with which the machines must be "burned out."

In a large number of plants, the superheated oil is introduced with the steam apparently without attaining the highest efficiency of aatomization. This no doubt is the cause of a great deal of the operating difficulty reported. Great care should be taken to atomize the oil and introduce it through burners which do not destroy the effectiveness of the atomization. If the oil is not immediately evaporated when it enters the hot checker brick, the liquid will be greatly superheated in some parts and very incompletely heated in others before it can be converted into gas. The result of this so-called "stewing" is the production of a tar difficult to handle, the carbonization of the checker work with resulting lowering of generator efficiency, and a general operating difficulty due to irregularity of temperatures throughout the generators. However, when the oil is thus introduced in a fine spray, which permits almost immediate vaporization in the generator, practically none of the spray drops in liquid form into the checker brick and thus the "stewing" of the oil is eliminated.

When the gas leaves the generator it carries suspended in it lamp black varying in quantity from 5 to 50 pounds of carbon per 1000 cubic feet of the gas; it also carries a considerable amount of tar and naphthalene. The gas leaving the generator bubbles through water in the wash box and most of the lamp black is separated from the gas by this process. If the gas is not properly freed from lamp black in the wash box the mixture obtained in scrubbing is made up of tar, water, and lamp black in proportions that are at times difficult to separate and handle. Notable progress has been made in operation of the wash box in some of the California plants where the gas is passed for the distance of 5 to 15 feet under water in order that practically all of the lamp black may be removed before the gas enters the scrubber. This elimination of lamp black greatly facilitates scrubbing and results in the production of a tar which can be easily handled.

Some of the California companies have been able practically to overcome the difficulties of carbonizing the generators and of handling the tar and lamp black mixtures (or eliminating these by keeping tar and lamp black separate). There is every reason to believe that equally effective operating practice can be developed elsewhere to remedy those conditions which are in some plants still making the manufacture of a 600 B.t.u. gas a matter of some difficulty.

Oil Gas Cost Data.

Thus far the question of cost has not entered into this discussion, and it is evident that the relative cost of gas of different qualities should not be considered until it is clear that no serious operating limitation is to be expected.

For convenience of consideration, the cost data for oil gas were roughly classified. This classification has been somewhat arbitrarily made in many cases, but where it is desired only to estimate relative costs for different qualities exact estimates are not so necessary as they would be in a rate-fixing case. Throughout these compilations the result desired has been the determination for the several conditions of the number of B.t.u. available to the customer for each dollar of cost to him and the cause of fluctuation in cost with changing quality has been carefully considered.

The data which were received from the various Washington, Oregon, and California companies have been carefully examined by the Bureau; but it is not necessary to discuss these data in this paper. The summary already given indicates the general conclusions which may be drawn as to the heating value

standard for oil gas. It should be noted, however, that the difference in heating value available to the customer for one dollar, has not been found very great under the different conditions studied, or in other words, from the standpoint of minimum cost to the customer according to the data submitted, it is not very important whether the quality requirement be 550, 575, 600 or 625 B.t.u. It has been found that a discrepancy of 2 or 3 cents in the estimation of the items which make up the "proper selling price" for the different qualities, might be sufficient to change the conclusions as to the relative advantage of the different qualities.

Significance of the Change in Sales With Change in Quality.

If the quality of the gas supplied in any city is materially changed it is evident that the quantity which will be sold may also change. In some cases the total amount of heat required by the customer is independent of the quality of the gas; under other circumstances the volume of gas utilized will be practically constant regardless of the quality. This latter condition is found in the case of appliances which are turned on for fixed periods and which would not require (or perhaps more exactly stating the case, would not receive) a new adjustment for a new quality of gas. As a matter of fact in practice it is probable that some intermediate condition would represent the average.

Few data are available to show what changes in sales have actually accompanied changes in quality from the few cases for which the Bureau has secured such data, it is doubtful whether any general conclusions can be drawn. It should generally be anticipated that in case a change in quality of gas were made, the price per thousand being constant, the change in sales would be less proportionately than the change in quality.

If an increase in quality is not accompanied by a proportionate decrease in the quantity required, this fact will tend to make the cost per heat unit to the customer less with the richer gas, because some items of expense are constant in the aggregate for any period independent of sales. This fact should be recognized. However, it is not justifiable to take only this factor into consideration in determining which condition is the more desirable from the standpoint of the customer. The reason for this is as follows: Let us assume a 10 per cent increase in quality of gas is proposed for any hypothetical case; and let it be assumed that it is clearly shown that the decrease in sales to be expected will be only 5 per cent of the present sales. Then if estimates of the proper price to charge for the two qualities should show conclusively that the richer quality would deliver at least 1 or 2 per cent more to the customer for each dollar, we still must consider the fact that although the change proposed would give the customer more for each dollar, at the same time we admit he is going to use about 5 per cent more heat under the new condition. And since the sales were assumed to decrease less rapidly than the quality increased, it is evident that if such change were put in force the customer would get the benefit of more heat for each dollar, but at the same time the average customer would be paying more per month than formerly. The above case is purely hypothetical and in actual practice perhaps no such condition might be found. However, it shows that it is impracticable to make an assumption other than that the total heat which is to be used under the two conditions is the same.

Conclusions Drawn From Oil Gas Data

The conclusions which have been reached after full consideration of the data presented to the Bureau may be summarized as follows:

(1) Only one experienced oil gas engineer has submitted estimates which indicate as great economy in cost of a heat unit delivered to the customer in gas of less than 600 B.t.u. per cubic foot.

(2) In order to conclude from this single set of estimates that 600 B.t.u. gas would cost the customer more per heat unit than 550 B.t.u. gas it is necessary not only to assume that the sales would decrease in proportion as the quality increased, but also that the expense per thousand on practically all items would increase directly as the sales decreased.

(3) The assumption that the sales would decrease as rapidly as the quality increased can not be admitted.

(4) All expenses per thousand would certainly not increase proportionately as rapidly as the sales decreased.

(5) If the single estimate, which indicates greater economy for the poorer gas, is recalculated on a basis believed to fit the facts more exactly, it appears that the richer gas would be equally economical in any case unless the expense items per thousand increased more than nine-tenths as rapidly in percentage as the sales decreased.

(6) The opinions of the majority of engineers consulted, which indicate that a 600 B.t.u. oil gas costs less per heat unit put in the holder than 550 B.t.u. oil gas, are accepted by the Bureau as probably generally applicable.

The general conclusion from the cost data studied is, therefore, that gas of 600 B.t.u. per cubic foot may be regarded as at least equally if not more economic, from the standpoint of the total cost to the customer per heat unit, than any poorer quality.

Other Factors Affecting Heating Value Standards.

After it has been established what manufacturing limitations there are and what is the relative cost per heat unit delivered to the customer with different gas qualities, there still remain several factors which must be taken into consideration. The most important of these are worthy of brief consideration.

The lamp black briquettes made as an oil gas by-product form a high grade fuel, particularly valuable in those localities where no anthracite or high grade coke are available. This fact is sometimes used as an argument favoring the manufacture of a poorer quality of gas since with the poorer quality of gas a somewhat higher yield of lamp black is obtained. However, unless the production of a larger amount of this by-product decreases the net cost of the gas per heat unit delivered to the customer, it is hardly

reasonable to urge the production of a larger amount of the lamp black.

The more uniform in quality a gas is, the greater satisfaction with which it can be utilized. It is important, therefore, in fixing any standard of quality to ensure that it is possible to obtain uniformity in quality. There are two causes of variations: First, irregularities in manufacture, and second irregular distribution losses, either of which will produce irregularity in quality of the gas at the point of utilization. As far as could be determined by the Bureau, no greater difficulty would be met in securing reasonably uniform manufacturing results with one quality of gas than with another, at least up to a gas of 600 or perhaps 630 B.t.u. per cubic foot; and under the climatic conditions of the states where oil gas is made, the distribution losses are very small. It seems therefore that manufacturing irregularities and distribution losses need not be regarded as serious factors in the consideration of a heating value standard for oil gas so long as the requirement be 600 B.t.u. per cubic foot or lower.

In most cases the usefulness of a gas is regarded as proportional to its heating value and as far as the Bureau can determine this is the only reasonable assumption which can be made in the consideration of various heating values. Any argument based on the assumption that the customer will utilize more nearly a constant volume of gas than a constant amount of heat in any given period is not conclusive, since it frequently leads to the conclusion that a lower quality of gas will permit delivery of more heat to the customer for the dollar but will require the customer to pay a larger amount per month for the total service received. A line of argument leading to such conclusion certainly should not be followed in fixing a heating value standard. Under certain conditions there is no doubt that a somewhat higher efficiency will be obtained in the utilization of a poorer quality of gas than with a very rich quality, but it is doubtful whether any material increase in the percentage of total heat utilized would be found by decreasing the quality from 600 to 630 as commonly supplied to 550, the lowest value usually considered desirable as a heating value standard.

In the fixing of standards for heating value the possible developments of the industry are often given extended consideration. This, of course, is proper if any of the developments immediately contemplated would be interfered with by the standard proposed. However, under state commission control where frequent change in requirements can be brought about as changing economic conditions may demand, it is usually unnecessary to give extended consideration to any conditions not actually existant or certain to be met in the immediate future. For example, it is rarely necessary to consider prospective changes in costs or availability of fuels unless large changes in price or entire discontinuance of supply is probable in the immediate future. State commission control has as one of its chief advantages the flexibility of the requirements under which the companies operate. This flexibility will care for changing economic conditions as they arise, but it is usually unnecessary to anticipate changes by setting standards suited to future conditions whereas higher or better standards could be justifiable for the immediate present.

One factor, sometimes ignored in fixing standards, is the attitude of the public to the requirement which may be proposed. There is no doubt that comparison of standards or comparison of rates between various cities or states may lead to serious misunderstandings and perhaps to unfair complaint, but the fact must be recognized that such comparisons always are and always will be made by those who cannot be familiar with the technical phases of the subject.

It is desirable therefore to anticipate such criticism by eliminating in so far as is fair and just the chance for unfavorable criticism of any party involved. This fact has lead the Bureau to believe that in any case where those in authority can, without injustice to the public or to the company, fix a standard or rate similar to those standards or rates in force elsewhere, so long there is some advantage inherent in such particular standard or rate. In advancing any such argument, however, the Bureau would wish it understood that the probable attitude of the public as regards a rate or a standard should be considered a determining factor only in those cases where there is no technical reason which would justify a positive decision in one way or another. In other words, this public relations aspect of the case should be regarded as an important phase of the subject only when all other factors as determining a decision have been considered without reaching a satisfactory conclusion.

General Summary.

In the consideration of the information which has been gathered by the Bureau in connection with its study of oil gas conditions considerable difficulty has been met in the determination of the actual facts relative to a number of technical questions. This difficulty has arisen largely because of the conflicting evidence presented by different gas engineers whose experiences have led them to adopt different operating practices or to utilize different types of machinery. After having found such cordial co-operation between the different gas interests engaged in the manufacture of water gas and coal gas, the Bureau has been greatly surprised to note among the oil gas engineers the lack of co-operative effort in the development of their plants and processes. In several cases companies have been found which have adopted types of machinery or operating methods which had previously been discarded after extended experimentation in other plants. Even allowing for the difference in opinions naturally resulting from operating under different conditions, it is hard to see why certain machinery has been installed and certain processes have been adopted which appear to have been supplanted elsewhere by other machinery or processes markedly more efficient.

From the information which has been collected as indicated throughout this paper, the Bureau has found no reason to change the essential parts of its recommendations as given in Circular No. 32, it seems in general that these recommendations are suited not only to water gas and coal gas but also to the western states where oil gas is the principal product.

LETTER TO THE EDITOR.

Inductive Interference Report.

To the Editor:

Sir: I would like to be allowed a little space in your valuable magazine to express to your readers the views of a telephone employee, as influenced by the published discussion in Spokane on the report of the Joint Inductive Interference Committee as submitted to the State Railroad Commission of the State of California, and the General Order No. 39 which was issued by the above commission soon after the filing of this report.

Upon reading the abstract of the above discussion as published in your magazine, the following points were very strongly impressed upon me: In the first place, no disbelief in the technical reports was apparent, and, secondly, the power men therein quoted were uniformly opposed to the telephone companies being allowed to interpose any effective objections to any operation or proposed operation of the power companies.

After a later reading of the complete transcript of this discussion, it was seen that very favorable comment was made upon the scientific aspect of the investigation, thus, by absence of denials apparently assuming the truth of the technical contentions. However, the idea seemingly was absolutely preposterous that any telephone company should be given any legal right to request, or in extreme cases, demand, such modifications in the operation of a power system as will minimize the disturbances which are not allowing even reasonably efficient operation of a given group of telephone lines. One speaker appears to consider this course illegal, as he proposes to prevent any other commission following the lead of the California Railroad Commission. Another speaker, while making favorable comment on the scientific work, termed the practical ruling to be an actual "insult" to the power companies. No insult was assumed at being proven to be the cause, but only in assuming anything to be due to a telephone company. Apparently another case of Divine Right.

About the only discussion, as bearing on the accuracy of the technical points, was brought in by a manufacturer of air break switches, who is naturally somewhat opposed to any regulations which tend to curtail his list of possible patrons.

But in this connection, I would state, that a matter of only a few weeks ago, all of the telephone circuits in a territory covering five hundred or more square miles, were rendered so noisy that operations on many lines had to be absolutely suspended for over twenty-four hours. Inquiry at all load dispatchers' offices showed their telephone lines to be unusually noisy, but that their power system were all operating normally. However, on the afternoon of the second day of this trouble, it was discovered that an air break switch had dropped out at a pole on a branch line. The station from which this branch line was energized was a substation having no methods of ascertaining whether or not this, or any other connected line was balanced for residual or any other kind of current.

This case of trouble was, as a matter of fact, fifteen or twenty miles from any of the telephone lines which were affected. This case shows that a connected line, although not actually on a parallel, can give extreme inductive effects at times, when connected with lines which comprise a parallel, also that neutral ammeters, as required by General Order No. 39, would at times give valuable indications of abnormal operations and, also, that individual air break switches can be productive of very bad inductive disturbances.

Referring also to a recent letter from a contributor to your magazine, I would also say that introducing the common battery telephone lines into this question, merely tends to cloud the issue, as General Order No. 39 and the preceding report, both explicitly exclude subscribers lines from the rulings, and limit the cases of parallels (on the part of the telephone companies) to inter-office metallic lines.

He also states there are doubtless many cases where the power companies have not been so innocent in their transgressions, yet in his closing paragraph, he contends that the cost of any changes shall be borne by the beneficiary. In citing the following case, which is an actual California occurrence, this lack of innocence is shown. This case also shows the injustice of the statement, that the beneficiary shall bear the expenses incurred in relieving the inductive disturbances, when applied to the ordinary California case, wherein the transmission line has been built over or close to a previously, existing telephone, telegraph or signal lead.

On a certain toll lead of about two hundred miles in length, long distance telephone service had been given for a period of years, possibly not ideally perfect, but to a very large degree, entirely satisfactory. A few years ago, a power company commenced to develop a territory through which this toll lead passed. A high tension transmission line was built for about twenty-five miles with parallels ranging from one quarter of a mile to four miles in length. On the longest parallel, the average separation of the transmission and telephone wires is hardly more than ten feet. In this parallel the associated primary wires were placed so close to the telephone wires, that in several places, these primary wires have hung down through the telephone lead. Several physical contacts have occurred due to this cause, the results of which leave little to the imagination of a telephone man, but I believe no damage has occurred to the primaries.

Owing to the extreme lack of separation between the various wires in these two leads, it became necessary for the power company to protect itself and its primaries, by removing them as far as possible from their transmission line, of which they were afraid, and carry these primaries as close as possible to those telephone wires of which they were not afraid. As a natural result of this policy, the telephone company has suffered severely, both from induction and from physical hazard, the total exposure to parallels being about fifteen miles of close parallels in this case. While it is true that primary wires are excluded from General Order No. 39, it is also true, that merely reasonable separations, such as this order will insure, will prevent any more such physical hazards to be constructed.

The transmission on these telephone lines has dropped fifty or sixty per cent. And, regardless of a specially designed transposition scheme installed in

the telephone lines, absolute isolation of all telephone wires at each end of one four-mile exposure leaves these telephone wires so hot that they are unsafe to handle with bare hands. And this in a short four-mile stretch.

Based on this discussion, and your recent contributor's letter, it would appear that priority rights of occupation of a given location, such as this telephone company had, are to be absolutely disregarded. And when the efficiency of the telephone system has been so reduced, solely due to the inductive interference both from normal and abnormal operation, of the adjacent power system, the telephone company shall, as the beneficiary of any changes, be generously allowed to bear all of the expenses of such changes. Very naturally, however, this becomes an extremely serious question, as the number of existing parallels will be found to be extremely great. It will, however, be difficult to find but few, if any, cases where a telephone toll lead has been constructed closely adjacent to an existing transmission line. This would tend to indicate an extreme lack of interest, to say the least, on the part of the constructing engineers of the power system, regarding the efficient or inefficient use of the telephone systems which happen to be in the way, on the new routes the power men have chosen.

It was assumed at Spokane that the power companies were in a box, the door of which was under the control of the telephone companies. It would seem, however, to be nearer the truth, to state, that this becomes the first time the telephone companies have been able to even see out of the box in which they have been confined since the first existence of high tension networks.

Many operators have been carried from long distance offices unconscious from the severe shocks sustained on these toll lines when switching changes are made. These shocks are not electrical shocks, but result from terrific crash occurring on these lines at such times, and which will vividly illuminate vacuum arresters used on these lines. Numerous tests have been made which absolutely prove that these shocks are due to power switching operations. Power station operators in many cases remove their telephone from the line at such times, but the commercial operator, and the subscribers do not have the advantage of previous information. This case is one that doubtless can be entirely cared for, only by great separation or entire avoidance of parallels.

One speaker at Spokane, advocates the use of reactances and condensers for quieting the telephone lines, but then finds a high powered transmitter is necessary.. But. what a simple matter it would be to use high powered transmitters at all telephones which will be liable to use the toll service over lines paralleling high tension lines which may be causing inductive disturbances of a severe character. It has been stated by power men that owing to the extremely noisy condition of many of their own dispatching lines, many cases of reports coming to the load dispatchers are unintelligible, but that upon looking at the clock they knew what to expect and therefore record the case in the station log book, knowing that a certain operation was due at a certain time of day at a given station. If, under such conditions experienced men are unable to even guess at what is being said on a given line, what chance have two strangers, possibly aged and infirm, to communicate over a line which, while not equally noisy, yet approaches to a dangerously approximate condition.

It hardly seems possible that the speakers in this Spokane discussion realized the fact that power men were equally represented on this committee with the signalling interests, and having a greater representation on the committee than the telephone companies. A personal acquaintance with some of these members would hardly lead one to believe that they were of such a low mentality as to allow anything of such a vicious character as these regulations are called, to be "slipped over" on them.

Much work by power companies has already been completed, and much more designed in the past year or two, in some sections of California at least, which is conforming to a marked degree, with the requirements of General Order No. 39. There is also much construction still in use, and which is of recent date, comparatively, which to any one having any conception of the danger, constitutes a physical hazard which is a positive disgrace to the engineers who were responsible for the work. And in many cases personal responsibility cannot be shifted, as telephone officials have made personal verbal complaints to the engineers and general officials in charge at the point of complaint, and in at least one case has the complaint been justified, for one lineman was killed at one of these points, in a matter of only a few weeks after the complaint was made. Luckily for the telephone company, however, it was one of the power linemen.

So, to the power men of California, who have already started to do work along the lines designated by General Order No. 39, these rulings do not seem as harsh, as to some of the other school, who are either too selfish or too blind to see the rights of others or to those to whom the value of an extra five feet on the top of a pole, is in excess of the value of a human life.

These power men who see the benefit to signalling lines of others, which may be obtained by these required changes, also see, that it may be possible for their own officials to talk on some lines of their own, where now, none but experienced operators are able to converse intelligibly. It may, however, be found, that the power men who were on this Joint Inductive Interference Committee, have during the past two years, educated themselves to a point far ahead of these self-appointed critics, who have so strenuously objected to these rulings.

In closing, I wish to state that I am in no way representing the Joint Inductive Interference Committee. The opinions herein stated being those I have held for a long time, and which I feel have been plainly verified, by the extreme rancor expressed by the men who either insist no changes shall be made, or if made, are to be paid for by the injured party. And such a viewpoint certainly lacks justice as considered by

A TELEPHONE EMPLOYE.

Los Angeles, Oct. 19, 1914.

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Depreciation

Almost all engineering work is based upon such rigid physical laws, such definite mathematical rulings, that there has been little difficulty in deciding as to what is the best engineering practice to meet given conditions. Yet there would be no engineers if it were not for honest differences in opinion. Especially is this true for the new science of valuation which is now engaging the attention of many engineers and concerning which there has been so much controversy.

Considering valuation as a science, a mistake has been made in trying to fit observations to assumed rules. Heretofore there have been many abstract generalizations and few concrete facts from which to formulate a proper procedure. Evaluation has been based upon telescopic rather than microscopic evidence.

The remedy lies in a more detailed study of individual conditions. There must be many facts to classify before classification can be commenced. Generalization should not be attempted until there are sufficient data to justify an unprejudiced judgment.

An excellent start in this direction has been made elsewhere in this issue by W. G. Vincent, who has given much study to the conditions of the great hydroelectric network supplying the light and power needs of northern California. By first limiting the discussion to valuation for rate-making purposes and then narrowing to the problem of depreciation he has been enabled to concentrate upon a few details at a time and thus reach some valuable conclusions.

Depreciation is the center about which valuation revolves. After the loss in value has been determined there is comparatively little difficulty in calculating present value.

Assuming that the value new of any piece of apparatus was its cost new and that its value at the end of its useful life will be its scrap value, Mr. Vincent argues that its value at any intermediate period in its probable life is equal to the first cost minus the depreciation fund which has accumulated at compound interest on the sinking fund basis. This "sinking fund" method he believes to be preferable to the older and simpler "straight line" method which assumes that depreciation is a direct function of time. He demonstrates that the fallacy in the straight line method lies in its failure to differentiate between first cost and total cost and in its assumption that the initial cost is the same as if it were paid for in equal installments throughout its life. Furthermore he contends that there is an actual relation between the time depreciation of equipment and the rate at which money accumulates.

Although greatly in favor of this sinking fund method Mr. Vincent is broad enough to recognize that sufficient time has not yet elapsed nor enough expert engineering experience has not yet been had to furnish reliable data for "life tables" of engineering structures.

So he advocates that it be combined with the observational method in order to obtain accurate results.

Yet these two methods, while capable of refinement, are still far from perfect. The observational estimate of damage from use and deterioration is absolutely dependent upon the personal equation. One man's judgment may be as good as another's and there are usually as many different valuations as there are observers. The sinking fund system of determining life expectation is liable to be based upon unreliable data and its plausibility may lead to erroneous conclusions. Mr. Vincent recognizes this danger when he advises that the method not be applied to obsolence and inadequacy, a functional depreciation which is indeterminate for future conditions. None of the dozen or more recognized methods of estimating depreciation are able, nor should they be expected, to anticipate the loss in value due to improvement in the art. The path of progress is a curve which the finite mind has not plotted.

The main point which this and other papers emphasize is the need for more definite information as to the mortality of equipment. Each of the engineering societies would do well to appoint a committee to collect data from which standard deductions may be drawn. With such information as a foundation it will then be possible to develop a true science of valuation.

Inductive Interference

Since the hostile reception at the Spokane Institute meeting to the report of committee on inductive interference, a number of engineers, including several members of the committee, have rallied to its defense and endeavored to take the "fear" out of "interfe(a)rence," as far as the power interests are concerned. They have proven the inequity that formerly existed and have justified many of the steps which have been taken to correct the difficulty.

The report was presented and discussed at the October meeting of the San Francisco Section of the American Institute of Electrical Engineers and will form the subject of the November meeting of the Los Angeles Section. At the former meeting emphasis was laid upon the fact that the report was not final, but subject to future revision. No protest of moment has yet been received from the California power companies and promise was made that full hearings would be accorded any complaints of discrimination against air-break switches.

Even at this meeting sufficient credit was not given to the scientific merits of the report. This aspect of the investigations is worthy of an extended discussion unobscured by commercial issues. The committee has given ample assurance that the studies and recommendations were made in the spirit of true research. The conclusions in several of the appendices are especially valuable studies of the phenomena in electric circuits.

A vigorous statement of the telephone companies' viewpoint is also published elsewhere in this issue. The author, because of modesty, has requested that his name be withheld from publication, but the editor will give it to anyone interested. Human sympathy naturally flows to the under-dog, a role which the telephone company has occupied for many years, their situation having aptly been compared to running a hospital next door to a boiler shop.

The greatest good accomplished by the report, is the feeling of mutual respect and sympathy which has been created between the telephone and power companies. Each now understands the difficulties under which the other has been working and each side has made concessions so as to insure not only a physical harmony between transmission and communication circuits but also a mental harmony between the men engaged in their operation. Above all else they have demonstrated that it is possible for engineers to get together and reach a common understanding without calling the ubiquitous lawyer into the controversy.

The George Bill

Governor West of Oregon apparently believes in "letting George do it" when it comes to removing a state engineer. The Desert Land Board, and incidentally the office of state engineer, is proposed to be abolished by the George bill, an initiative measure—initiated by Governor West. Many engineers and others devoutly hope that the ensuing result will be that usual when George is asked to do it.

It is claimed that the present incumbent in office is not personally acceptable to the governor and that it is considered more expedient to abolish the office on the ground of economy than the incumbent on the ground of personality.

Neglecting all personalities, it is the consensus of expert engineering and legal opinion that the administration of Oregon's water resources since 1909 has been most satisfactory. The water code of 1909 provided a full determination of existing rights in a single proceeding, the proper distribution of water by state officials and complete control of the acquirements of new rights. Its constitutionality was upheld by the Federal District Court during the past month and many of its provisions have been embodied in the proposed California code. There has been no accusation of mal-administration, but simply a plea of economy, without regard to the need for the work or its efficiency.

The enactment of this bill would mean the cessation of joint topographic and stream survey in cooperation with the U. S. Geological Survey. The data on stream flow forms the basis for investment in irrigation and hydroelectric plants and are essential to the development of the state. Many other plans for the beneficent utilization of Oregon's natural resources would also be delayed by its passage.

The Oregon Society of Engineers, the Oregon Hydroelectric Commission and the commercial clubs of several of the larger cities have condemned the measure and endorsed the activities of the state engineer. They adduce strong arguments to prove that the efficiency of their model water law will be impaired and that economy will not be promoted by the George bill. A vote in its favor is a backward step, negation here represents progress.

PERSONALS

W. S. Herrick, an electrical contractor of Sanger, Cal., was a business visitor at San Francisco during the week.

Charles Perry of the Perry Electric Company, Coalinga, Cal., spent several days during the week at San Francisco.

W. E. Hayes, proprietor of the Hayes Electric Shop, Santa Rosa, Cal., spent a few days in San Francisco during the past week.

Wilbur Pounder, Pacific Coast sales manager Hubbard & Company, expects to make a short trip throughout the Sacramento Valley this week.

Robert Howes, hydraulic engineer at Seattle, is inspecting the Sauk and Suitattle power site forty miles from Seattle for the city engineer of Seattle.

D. C. Jackling, president Utah Power & Light Company, of Salt Lake City, recently returned from Alaska, where he has been for the past two months.

R. H. Manahan city electrician of Los Angeles who has recently returned from the East where he has been studying fire alarm systems, spent a few days last week in San Francisco.

Thomas Mirk, president Hunt, Mirk & Co. of San Francisco, is on a business trip throughout the southern part of the State. He expects to return to his office in about ten days.

A. J. Myers, Pacific Coast manager Wagner Electric Company, expects to return to San Francisco about the first of the week from Los Angeles and the Southwest, where he has been for the past week.

E. C. Jones, gas engineer of the Pacific Gas & Electric Company, has been elected president of the American Gas Institute. Mr. Jones is also president of the Pacific Coast Gas Association and prominent in the plans of the International Gas Congress to be held at San Francisco in September, 1915.

Thomas Finigan, vice-president Pierson, Roeding & Company, San Francisco, was elected vice-president in charge of entertainment at the Atlantic City convention of the American Electric Railway Manufacturers' Association. The 1915 convention of the American Electric Railway Association and affiliated organizations will be held at San Francisco.

Pierson, Roeding & Company announce the resignation of **Ralph L. Phelps** as manager of their safety cable department and the appointment of **C. G. Gauntlett** as manager of that department, together with the underground conduit and cable department. Mr. Phelps expects to go into business for himself, his plans being announced later. Mr. Gauntlett has just returned from an Eastern trip.

R. H. Sterling, formerly property agent of the Southern California Edison Company and at one time manager of the American River Electric Company at Stockton, has succeeded **John T. Huntington** as manager of the Santa Barbara Gas & Electric Company at Santa Barbara, Cal. Mr. Huntington has been appointed district agent of the Southern California Edison Company at San Pedro, Cal.

James P. Sprunt, detail and supply salesman of the Salt Lake office of the Westinghouse Electric & Manufacturing Company, has been discharged from St. Mark's Hospital, where he was sent as a result of injuries incurred in a railroad accident in the Logan yards of the Oregon Short Line Railroad Company. **Ralph Dinwoody** of the Inter-Mountain Electric Company, was also on the train but suffered no damage aside from a severe shaking up.

Charles N. Black, vice-president and general manager of the United Railroads of San Francisco, has returned from his trip East, where he presided over the annual convention of the American Street Railways Association held at Atlantic City. The next convention of the association will be held in San Francisco next October, and Mr. Black was delegated to make all necessary arrangements and find the hotel accommodations, as unquestionably the full force of the association will come to San Francisco next year.

Howard Joslyn, author of the leading article on Seattle's fire alarm system in this issue, is city electrician at Seattle and is responsible for the excellent installation which has been made there. Mr. Joslyn is one of the pioneer electrical engineers on the Pacific Coast, having come to Seattle in 1888 after graduating from Wabash College in Indiana. He assisted in the installation of the equipment of the Domestic Heat, Light & Power Company, later being made manager. In 1894, he became associated with the Westinghouse Company as engineer and salesman at Tacoma, resigning in 1897 to assume the duties of city electrician in charge of the Tacoma municipal light and power plant and signal service. During 1898-1901 he acted as electrical engineer for the Snoqualmie Falls Power Company, resigning to enter the Northwest office of John Martin & Co. This and private engineering work engaged his attention until 1903, when he assumed his present duties. Within the past ten years he has not only increased the signal facilities over 500 per cent, but also has been instrumental in securing municipal electrical inspection in accordance with Code requirements. During the four years that he has had charge of the inspection bureau inspection has been put on an established basis, resulting in much benefit to citizens and workmen. He is a member of several engineering organizations and one of the best-known electrical men in the Pacific Northwest.

MEETING NOTICES.

Seattle Section A. I. E. E.

The first meeting for the new season was held at a local cafe on December 20th. After dinner the work for the year was outlined by the chairmen of the executive and program committees. President Lindsay then reported on the Detroit meeting, at which he was the official representative of the Seattle Section. Later John Harisburger reported to the meeting of the Pacific Coast Sections held at Spokane in September, after which the meeting adjourned.

Portland Section of American Society of Civil Engineers.

The Portland Association of Members of the American Society of Civil Engineers held their annual meeting at the Commercial Club last week and elected the following officers: President, George C. Mason; second vice-president, John T. Whistler. The terms of the first vice-president, secretary and treasurer do not expire for another year. John H. Lewis, State Engineer, read an interesting paper on "State Engineer's Department and its Relation to Development in Oregon."

Portland A. I. E. E. and N. E. L. A. Sections.

The next meeting will be held on the night of November 10th at the new building of the Pacific Telephone & Telegraph Company, Portland, Oregon, at which time the building will be thrown open for inspection. W. D. Scott will give a talk illustrated by lantern slides on the construction of the telephone company's Portland building and typical central office equipment.

Mr. G. P. Nock and W. D. Scott will give a paper on "The Telephone Plant With Relation to Fires."

On December 8th the meeting will be held in the auditorium in the Journal Building and the paper of the evening will be presented by Mr. J. C. Stephens, civil and hydraulic engineer, on "Hydroelectric Developments in Spain."

Utah Electric Club.

The regular weekly luncheon of the Utah Electric Club was held at the Commercial Club Thursday, October 22d. W. H. Gregory, attorney for the Salt Lake Route, discussed the Interstate Commerce Commission and its relation to the railroads outlining the history of the regulation of interstate commerce from the time of the 13 original colonies down to the present date. He assigned as one of the fundamental reasons for the adoption of the Constitution of the United States the necessity which the colonies felt of having a centrally organized government to deal with the multitudinous problems arising from inter-colony commerce and intercourse, and showed how the Interstate Commerce Commission as we now have it was the outgrowth of the complex problems arising from the rapid development of the railroads from the latter half of the 19th century.

Oregon Society of Engineers.

The regular noon-day luncheon was held at the Hotel Burson, Portland, Oregon, October 19th. The speaker of the day was Mr. W. H. Galvani, property and tax agent of the Pacific Power & Light Company. The chairman of the day was E. G. Hopson, supervising engineer U. S. Reclamation Service. Mr. Galvani spoke on "World Peace."

Mr. Galvani arranged his title especially to appeal to engineers who are accustomed to deal with "facts." These facts embraced statistics of the cost of war, which now amounted to 3½ times the total amount of world wealth in gold and silver, and over 70 per cent of this had been incurred in the last 100 years. Over 8000 peace treaties had been signed in 3000 years. Taxes per capita had increased over 500 per cent in the last 100 years to take care of this war debt. That during the last 100 years Canada and the United States had lived side by side without any armament at all. While all the vast preparations of Europe and Asia had only tended to breed more war and added war debts.

He further followed historically the causes of the present war in Europe and methods pursued by all nations when engaging in war to claim that they were only fighting to obtain peace. He appealed to the engineers to lend their influence for peace.

WASS-HAEL.

The annual festival of Wass-Hael, celebrated from time immemorial during the winter solestice by the Norsemen and Saxons and revived as an annual custom in San Francisco by a number of jovial spirits in the electrical fraternity, will be again celebrated this year on Saturday afternoon, December 19, 1914.

At a preliminary meeting held Monday it was decided to hold this reunion at Bergez-Franks restaurant, where Camille promises to provide some new and tempting culinary innovations and the committee will spring several new, novel and pleasing features of entertainment.

Those invited to assist in making this year's celebration the most successful of any attempted are

T. E. Collins
N. K. Cooper
H. G. Aylsworth
A. E. Wishon
F. H. Poss
T. C. Morris
H. H. Daley
Wm. McKinley
E. J. Moldrup
A. V. Thompson
H. H. Cudmore
R. E. Eltringham
Jos. S. Thompson
L. A. Somers
A. E. Rowe
H. E. Sanderson
Al C. Joy
Alan E. Morphy of Los Angeles

NEWS OF IDAHO PUBLIC SERVICE COMMISSION.

A complaint has been filed with the Public Utilities Commission of Idaho by the mayor and council of Wallace, Idaho, alleging that the rates charged for service by the Northwest Light & Water Company which company has a monopoly of the electric and water business of that city, are too high and asking that the commission order a reduction.

NEWS OF CALIFORNIA RAILROAD COMMISSION.

The commission has rendered a decision authorizing the Contra Costa Gas Company to issue 611½ shares of its capital stock of the par value of $100, per share, and $10,900 of its first mortgage 6 per cent 10 year bonds. The commission's order provides that these bonds are to be sold at not less than 90 per cent of their face value and accrued interest. Authority is also given S. Waldo Coleman to transfer certain franchises granted to him by the towns of Concord, Martinez, Pittsburg and Antioch, to the gas company.

The commission has rendered a decision authorizing the Hughson Telephone Company of Stanislaus county to issue 5000 shares of its common capital stock having a par valaue of $1 per share. Of this amount 3675 shares are to be issued in lieu of an equal number of shares previously issued without the consent of the commission; 550 shares are to be issued to F. C. Nickle to cover expenditures previously made for additions and betterments, and 775 shares are to be issued for the purpose of providing funds for extensions to the company's telephone system.

The commission has rendered a decision authorizing the Northern California Power Company to issue 5000 shares of its 6 per cent cumulative preferred stock having a par value of $100 per share to its stockholders at not less than $80 per share. The proceeds derived from the sale of this stock are to be used for reimbursing capital account in the sum of $225,000 and for additions and betterments to the applicant's properties in the sum of $175,000.

The California Street Cable Railroad Company of San Francisco filed an application with the commission last week requesting authority to issue $384,000 of serial bonds having a par volue of $1000 each, at a price not less than 90. These bonds will bear interest at the rate of 6 per cent and will mature in blocks annually—the first block, maturing January 1, 1916, and the succeeding blocks maturing respectively on the first day of January of each succeeding year up to and including January 1, 1927. The company proposes to use the proceeds from the sale of these bonds in refunding outstanding bonded indebtedness falling due January 1, 1915, amounting to $900,000. The difference between the amount secured from the sale of the proposed bonds and the outstanding indebtedness will be made up from moneys which the company now has in its sinking fund.

The commission has issued a supplemental order authorizing the Sonoma Valley Water, Light & Power Company to pledge its bonds in the sum not exceeding $30,000 as collateral for a $15,000 loan. It is provided in the order that the loan shall be made at a rate of interes not to exceed 8 per cent and for a period not exceeding 6 months. The commission has also issued an order extending the time in which the company may issue $30,000 of its 6 per cent bonds from October 1, 1914, to December 31, 1914.

The commission has made a supplemental order approving the form of a trust deed to be executed by the Southern Counties Gas Company of California to the Central Trust Company of Illinois and William T. Abbott.

The commission has rendered a decision authorizing notes amounting to $2,116,575 previously issued by the Northern Electric Railway Company without approval of the commission. The commission also authorized notes amounting to $37,079.50 issued by the Marysville & Colusa Branch and notes amounting to $118,750 to subsidiary corporations of the Northern Electric Railway Company. The purpose of the order just issued is to place the creditors holding notes now invalid in the same position as they would have been had their notes been legally issued with the authorization of the commission.

The commission has rendered a decision authorizing the Pacific Gas & Electric Company to renew a promissory note in the sum of $100,000 to the National Conduit & Cable Company, bearing interest at the rate of 6 per cent per annum and payable not later than October 20, 1915.

TRADE NOTES.

Link-Belt Company has changed its Seattle offices from 512½ First avenue South to First avenue South and Railroad Way.

The Westinghouse Electric & Manufacturing Company has moved its Seattle offices from the Central building to the Alaska building.

The Seattle offices of the Westinghouse Electric & Manufacturing Company have been moved from the Central Building to the Alaska Building.

The Dalles Electric Works of the Dalles, Oregon, have obtained the electrical contract for the new high school building being erected in The Dalles.

The Johnson Service Company, Seattle, has been awarded the contract for installing temperature regulators, thermostats, etc., in the new high school at Kalispell, Montana.

W. A. Kraner Company of Portland, Oregon, has obtained the electrical contract for the new administration building being erected by the University of Oregon at Eugene, Oregon.

The Balfour, Guthrie Company is installing 3-20 and 1-50 h.p., 220 volt, 3-phase, 60 cycle motors on the O. W. R. & N. Company's Dock at the foot of Russell street, Portland, Oregon.

The C. H. Wheeler Manufacturing Company has supplied the Inspiration Copper Company of Arizona with three complete condenser equipments and a 3000 kw. condenser equipment to the city of Pasadena.

The William E. Chase Engineering Company of Seattle was the low bidder and probably will be awarded the contract for installing the curb lighting system along First avenue, from Bernard to Cedar street, Spokane, Wash. The bid amounted to $70,400.

The Edison Storage Battery Company, of which H. J. Mitchell is Seattle manager, is installing a storage battery of 100-cells, B-4, 80 ampere hours in the snag puller "Swinomish," which is being constructed by Hall Brothers at Winslow, Wash., for the United States Government.

The Nevada Valleys Power Company has let a contract to J. W. Finch of Riverside, Cal., for the construction of its 82 mile transmission line from the government power house at Lahonton, Nev., (which they have leased from the government for a period of ten years) to Rochester, Nev. Construction will begin November 5th.

W. R. Hendry of Seattle has purchased the interests which J. F. NePage and V. S. McKenney formerly held in the concern of W. R. Hendry & Co., and has disposed of his holdings in the NePage-McKenny Company to Messrs. McKenny and NePage. Mr. Hendry will continue to conduct the business of W. R. Hendry & Co., high tension installation engineers.

The General Electric Company has obtained an order for the motors to equip the new mill being built by the Weyerhauser Lumber Company at Everett, Washington. The motors vary from 3 h.p. to 250 h.p. and are 550 volt, 3-phase 60 cycles. There will be 218 motors of various sizes installed in this mill. All the switchboard equipment will be furnished by the General Electric Company. The amount of the contract is approximately $60,000.

H. H. Manny has opened an office at 436 Henry Building, Seattle, as a strictly manufacturers' agent and contemplates handling practically the same lines that he has handled for the past few years. Among these lines are the National Telephone Supply Company, Cleveland, Ohio; Paragon Electric Company, Chicago; Robinson Fire Apparatus Manufacturing Company, St. Louis; and the Marion Insulated Wire & Rubber Company, Marion, Indiana. The business at 436 Henry Building is being conducted as the Manny Supply Company.

The San Francisco office of Allis-Chalmers Manufacturing Company has sold recently 22 engines and 11 generators to be used on an oil pipe line between Coalinga and Martinez; a 350 k.v.a. a. c. generator, exciters and motors to the Mountain King Mining Company of San Francisco; a 7 million gallon pumping engine for the city of Santa Ana; a 500 kw. steam turbine alternator with auxiliary apparatus for California Pine & Redwood Lumber Company of Portola, Cal; also a 14x21 Allis-Chalmers Diesel engine to J. B. Dale, Phoenix, Arizona.

The County Commissioners of Kern County have awarded to the Power Equipment Company of San Francisco the contract for the construction of the Keene power line, which is to be used in the operation of the new county rock crushing plant. This line is ten miles in length over a very rough route. The longest line spans are 3200 feet long and there is an average of but eight spans per mile for the entire line. The transmission line as well as the telephone line will be of ¼-inch Siemens Martin steel cable, supported on suspension insulators. The supporting structures will be of cedar, with fir cross-arms.

The strike of inside wiremen which was precipitated in Salt Lake City by the refusal of the electrical contractors to do business with E. A. Wilcox, business agent for Local No. 354 of the Electrical Workers, was settled on October 21st by the decision of the Salt Lake Federation of Labor with which the Electrical Workers are affiliated to oust Mr. Wilcox from the position of business agent. Following this action a meeting was held between the representatives of the Trade Council and the Electrical Contractors, and all points of difference between them were settled. The electrical workers and members of other branches of the Building Trades Council who had struck in sympathy resumed work on Friday and the work on several important buildings, including the Newhouse Hotel, Eagle Gate, and Richmond Apartments, the Whitmore Apartments, the Vissing Apartments and the Ensign Ward Chapel, will be rushed to completion. By the new agreement just entered into which is substantially the same as the one under which the electrical wiremen had been previously working, the rate of pay will be increased from $4.50 to $5.00 with time and a half for over-time work on January 1st, providing business conditions are such as to warrant such an increase.

PUBLICATIONS RECEIVED.

"The Thermal Properties of Steam," by G. A. Goodenough, has been issued as Bulletin No. 75 of the Engineering Experiment Station of the University of Illinois. The bulletin presents a critical discussion of the experimental investigations of the various thermal properties of steam, an outline of the thermodynamic relations that must be satisfied, and finally the development of a general theory of superheated and saturated steam. As a basis for such a theory the well-known Munich experiments on specific volumes and specific heats are taken and properly correlated through the Clausius relation. The assumed characteristic "equation" for steam is shown to fit the experimental points with extreme accuracy, and other tests are given to show the superiority of the equation over Lunde's equation, which has heretofore been employed. The equation for specific heat gives a corresponding close agreement with the Knoblauch and Mollier points. Simple mathematical manipulation leads to explicit expressions for heat content and entropy, and various tests applied show that the values thus deduced are in excellent agreement with the best experimental evidence. The range of temperature through which the theory appears to be valid extends from 32 degrees to 600 degrees F. for saturated steam. The corresponding upper limit of pressure is above 1500 lb. per sq. in. The result of the investigation is a formulation of the properties of steam for which the following claims may be urged: 1, absolute thermodynamic consistence; 2, extreme accuracy; 3, simplicity; 4. flexibility; 5, great range of validity.

INDUSTRIAL

REFLECTORS FOR NEW HIGH EFFICIENCY MAZDA LAMPS.

The semi-indirect unit, as shown in Fig. 1, consists of a Druid glass outer envelope within which is suspended a Holophane prismatic glass reflector; this latter directs the light upward toward the ceiling. Air passes downward between the reflector and envelope and upward through the center of the reflector, passing between the lamp and reflector.

The diffusing unit, shown in Fig 2, consists of an outer envelope of heavy opal with a bowl at the bottom of crystal roughed glass. Air enters around the lower band of the fixture and escapes through the hood above.

Fig. 1. New Semi-Indirect Unit with Prismatic and Diffusing Glass Combination for New High Efficency Lamps.

Fig. 3. Enameled Steel Reflector.

Fig. 2. Heavy Opal Envelope With Bowl.

For the illumination of platforms, shops, yards, etc., two types of enameled steel reflectors have been designed, the deep bowl B. E. E.-1000 and the shallow bowl B. E. D.-1000. The screening angle of the shallow bowl unit, shown in Fig. 3, is 85 degrees, while that of the deep bowl unit is approximately 70 degrees.

To meet the rapidly growing demand for lighting units to accommodate new high efficiency 750 and 1000 watt Mazda lamps, the Holophane Works has just completed the development of a line of reflecting and diffusing units for this service. Because of the high intrinsic brilliancy of the new lamps, as well as the high temperature of the filaments and necessary change in lamp construction, it has become necessary to develop this entirely new line of lighting units to accommodate the new lamp.

These units, as shown in the accompanying illustration, include enameled steel, Holophane prismatic and duffusing types. The three designs here illustrated are typical of each class.

AN ELECTRICAL CHRISTMAS.

One of the most attractive propositions, which the commercial section of the National Electrical Light Association has ever offered to central stations, is a booklet entitled "Gifts That Please," a Christmas booklet to promote the sale of heating appliances with a resulting increase in the central station load.

The booklet deals in an attractive manner with the various electrical appliances which make suitable Christmas presents. It is attractively prepared and will appeal particularly to the housewife. It brings out the modern idea of giving presents which have a utilitarian as well as an artistic value.

The booklets are designed to be enclosed with the monthly statements of the central station, as well as distributed over the counter to people coming into the office to pay their electric light bills. They may also be distributed from the various electrical stores throughout the town where they are to be employed.

The price has been established at $15 per 1000; $8.50 per 500 and $6 per 250. These prices make the booklet within the reach of every central station, large or small. The price includes imprinting with the name and address of the central station. Envelopes of special design may also be obtained at a rate of $3 per 1000, if so desired.

Inquiries for copies should be sent to N. H. Boynton, sales manager publication committee, Commercial Section N. E. L. A., Box 387, Cleveland, Ohio.

NEWS NOTES

INCORPORATIONS.

SAN FRANCISCO, CAL.—The United Electric Company of California, $10,000, shares $10 each, subscribed $30, by G. E. Campbell, P. Santoiemma and F. T. McDougal.

SEATTLE, WASH.—The Bremerton Gas Company has been incorporated with capitalization of $100,000 by Adam Schortgen, Frank L. Clarke and Lane Summers. W. S. Summers, 1037 Henry Building, attorney.

SIDNEY, MONT.—Articles of incorporation have been filed for the Sidney Light & Water Company, with capital of $50,000. Geo. D. Hollecker, R .H. Watson, H. H. Buttelman, E. P. Baldwin and others, are the incorporators.

OGDEN, UTAH.—The consolidation of the Ogden Rapid Transit Company and the Logan Rapid Transit Company which has been agitated for so long has been cconsummated and articles of the incorporation of the new company to be known as the Ogden-Logan & Idaho Railway Company, were filed recently with the county-clerk of Weber county. The new company is capitalized for $5,000,000 which is five times the combined capitalization of the two companies entering into the merger. It is announced that the additional capital will be expended in the near future in several important extensions including 44 miles of line between Logan and Brigham City which will connect together the two said systems, 21 miles between Logan and Preston, Idaho, and 6 miles between Idlewild in Ogden Canyon and Huntsville. The estate of the late David Eccles who prior to his death was the moving spirit in both of these companies holds a controlling interest in the new company. The incorporators, officers and board of directors of the Ogden, Logan & Idaho Railway Company named in the articles of incorporation, are: M. S. Browning, president; L. R. Eccles, first vice-president; R. B. Porter, treasurer; Royal Eccles, secretary; D. C. Eccles, A. P. Bigelow, W. H. Wattis, A. T. Wright, H. H. Spencer, and Joseph Scrowcroft, second vice-president, all of Ogden, and Mariner S. Eccles, Joseph Quinney, D. C. Budge, Joseph Howell, and H. E. Hatch, all of Logan, directors. P. D. Kline, who is not a member of the board of directors, is named as general manager.

FINANCIAL.

AZUSA, CAL.—The election for $55,000 light and water bonds has resulted in victory for the bonds after one of the most bitter fights ever held in the city.

ESCONDIDO, CAL.—An ordinance has been adopted by the board of trustees authorizing the issuance of bonds in the sum of $100,000 for a water system. The bonds will bear date of July 1, 1913, bearing interest of 5 per cent, payable semi-annually.

ARCADIA, CAL.—Bids will be received up to November 19th, for the purchase of bonds in the sum of $131,250, designated as Arcadia Water Bonds, 1914. The bonds will be 280 in number, 245 of denomination $500 each, and 35 of denomination $250 each.

SAN FRANCISCO, CAL.—The Pacific Gas & Electric Company will disburse on November 1st about $3,500,000. Aside from the $2,500,000 which will be paid out for the redemption of notes, November 1st disbursements on account of interest will amount to $800,000, and on account of sinking funds $175,000.

SAN FRANCISCO, CAL.—At a meeting of the bondholders' protective committee of the Marysville & Colusa Branch Railroad, Elliot McAllister was elected chairman and W. C. Ross, vice-chairman and secretary. Beyond organizing, nothing was done. The protective committees of the Northern Electric Company and the Northern Electric Railway Company bondholders are holding regular tri-weekly sessions. The committee representing the first mortgage bonds of the Northern Electric Company are endeavoring to ascertain from the Sloss trustees the segregated cash value of the property covered by the first mortgage, and the percentage of gross and net earnings which should be justly credited to this portion of the system.

ILLUMINATION.

SEATTLE, WASH.—The council of Port Angeles, Wash., has granted a franchise for power and light to J. L. Keeler.

SANTA ANA, CAL.—The Long Beach Consolidated Gas Company has been granted a franchise to operate a gas distributing system here.

BEAUMONT, CAL.—A contract is about to be closed with the Southern California Edison Company for installing a street lighting system in this city.

MONTESANO, WASH.—The application of L. H. Burnett and others of Aberdeen for a franchise for the operation of a gas plant in this city has been granted by the city council.

SEATTLE, WASH.—The board of public works will receive bids until November 13th for furnishing the city lighting department with one year's supply of distribution transformers.

SAN DIEGO, CAL.—City Engineer W. H. Rumsey has filed plans with the city council for the Point Loma lighting system. The plans call for 132 nitrogen lamps, each 400 candlepower.

SPOKANE, WASH.—The Washington Water Power Company has announced that it will not oppose the award of the First avenue electrolier lighting contract to the William E. Chase Engineering Company at $66,429.

SEATTLE, WASH.—The H. E. Gleason Company has been awarded the contract by the county commissioners of Clallam County for supplying $2000 worth of electric fixtures for the new court house at Port Angeles, Wash.

SEATTLE, WASH.—Plans are being prepared by Herbert C. Moss, White Building, for the complete electrical equipment in the $100,000 Elks Club Building, in Tacoma, Wash., for which C. Frere Champney, Henry Building, is the architect.

MANHATTAN BEACH, CAL.—The board of trustees has awarded the contract for lighting Twenty-first, Marine, Twenty-third and Sixteenth street, to the Southern California Edison Company, for $1.40 per month per post for single light, and $2.40 per post for three lights.

BAKER CITY, ORE.—Steps preliminary to the calling of a special bond election for the raising of funds by the city to increase the scope of the municipal lighting plant by providing for municipal lighting of homes and business houses as well as of streets have been taken by the city commissioners.

FRESNO, CAL.—Mayor Snow postponed at the last trustee meeting any discussion of his overhead wiring policy on the grounds that the plan is not feasible at this time and discussion of the installation of the new electrolier system was postponed by request of P. H. Harwood, secretary of the Merchants' Association. A sample electrolier has been installed in front of the city hall.

RICHMOND, CAL.—Petitions are in circulation by citizens who have organized to protest against the maintenance of what they assert is an exorbitant gas rate when compared with that of other cities of the State. The petitions are addressed to the City Council and are designed to induce that body to authorize the city attorney to summar-

ize the gas rate situation and go before the State Railroad Commission, ultimately, to seek relief.

SPOKANE, WASH.—The Washington Water Power Company is installing the 38 arc lamps which will light the streets between Washington and Post under the tracks of the railways. Eight lamps will be installed at each viaduct with the exception of Howard street, where there will be 10, and Post street, where there will be three. Two electric signs, each containing 500 lamps, will also be installed on top of the grain sheds at Howard street and at Washington street.

PASADENA, CAL.—A proposition is being considered for joining Pasadena and South Pasadena in an ornamental lighted way along South Fair Oaks avenue from Oneonta park to Green street. This will involve important changes in plans already made for an ornamental lighting system from Dayton street to California street, Pasadena. South Pasadena is planning to install a system of ornamental posts with one light 400 candlepower on both sides of South Fair Oaks avenue from Columbia street to Huntington Drive.

CALIPATRIA, CAL.—The Holton Power Company turned the electricity on at Calipatria recently and the whole town is brilliantly lighted. The largest transformer plant in the valley is located at this point and the longest transmission line in the world is now furnishing power and lights to all points in the valley. As Calipatria buildings are all arcaded and the lights on the same are uniform, the main street is as light as day, and the town was full of people from the surrounding country to help celebrate the turning on of the lights for the first time.

PORTLAND, ORE.—The city commissioners authorized Municipal Purchasing Agent Wood to advertise for bids for the installation of an electric lighting system in Columbia Park. The park at present is dark at night and is said to be considerable bother to the Police Department. The purchasing agent also was instructed to advertise for bids for the remodeling of the lighting system in Peninsula Park, the system there now being out of date and inadequate. It is proposed to have the work completed in time for use of the systems next summer.

LOS ANGELES, CAL.—As a part of the plan for beautification for 1915 the Finance Committee of the City Council has had in mind a scheme for the outlining of the front of the City Hall with incandescent electric lights. City Electrician Manahan was requested to make an estimate of the cost, and this was submitted recently. The total cost is estimated at $2650 for the installation and $85 per month for current and maintenance. This is considered too steep, in view of the city's present financial condition, and the Finance Committee has compromised on a plan for the placing of the recently-acquired city seal, worked out in colors, on the City Hall front, and its nightly illumination until 11 o'clock. A plan has been made for the outlining of the front of the new Hosfield building, in which many city departments will soon be housed.

TRANSMISSION.

THOMPSON FALLS, MONT.—The Thompson Falls Power Company has applied for a right of way for the Coeur d'Alene transmission lines through several sections of several townships.

SEATTLE, WASH.—The Puget Sound Flour Mill, at Tacoma, has discontinued the use of steam in its plant and is substituting electricity instead. The Puget Sound Traction, Light & Power Company will furnish the current.

SAN DIEGO, CAL.—The Escondido Mutual Water Company has made application to the board of supervisors for a franchise to build an electric transmission line from the reservoir on San Luis Rey River to Escondido is the company's plan to generate power at the damsite and convey same to consumers in and about Escondido. Work has begun on the power stations.

GOLDFIELD, NEV.—F. B. Mechling, district superintendent of the Nevada-California Power Company, was in Tonopah recently in regard to the new power line between Tonopah and Belmont for new milling and mining company to begin operations in the old camp about the first of the year. Chas. Wyckoff is the contractor. The work covers about 14 3-10 miles.

WOODLAND, CAL.—Deeds for 18 rights of way near Merritt Island, below Clarksburg, have just been filed here by the Great Western Power Company, showing beyond a doubt that the power company will include Yolo county in its territory. As the residents in reclamation district 150, which includes 7000 acres of some of the richest land in the county, are without power service at the present time and have been clamoring for electricity for years. The advent of the power company is heralded with much pleasure by the river farmers.

TRANSPORTATION.

SEATTLE, WASH.—The council passed an ordinance authorizing the P. S. T. L. & P. Co. to construct a freight spur from Latona avenue and E 65th street to block 87, Woodlawn addition.

SAN FRANCISCO, CAL.—That the Potrero and Van Ness avenue municipal railway will receive better patronage if the cars are routed east on Geary street to the ferries is the opinion of the Mission Promotion Association.

SEATTLE, WASH.—The Puget Sound Electric Railway Company, operating the Seattle-Tacoma interurban line, in its annual report for the fiscal year ending June 30, 1914, shows a loss of $148,513.92. The operating expenses for the year were $363,337.36, as compared to $387,770.40 for the previous year.

OAKLAND, CAL.—Deeds filed with County Recorder Bacon show that the Oakland, Antioch & Eastern Railway constructed its roads on a right of way and franchise granted to the Oakland and Bay Shore Railway in June, 1911. The grantees had insufficient funds to carry on the work, it is explained, and the Oakland, Antioch & Eastern took up the franchise. The deeds are dated March 14, 1912. Samuel Napthaly was president of the first named concern.

BERKELEY, CAL.—In an answer filed in the U. S. District Court the municipal officials of Berkeley, who were recently temporarily enjoined by Judge Dooling from preventing the operation of the Key Route trains, state that even if paving work is done on Grove and Adeline streets—which was the cause of the trouble between the company and the officials—they intend to stop "trains" running on Shattuck avenue and Adeline street, where the company only has a street car franchise. It is set forth in the answer that the company has no right to run trains on street car franchises.

TACOMA, WASH.—The Old Colony Trust Company of Boston trustee under the mortgage of the $1,500,000 bonds of the Tacoma Railway & Power Company, a subsidiary of the Puget Sound Traction, Light & Power Company, has secured from the Federal Court an order restraining the city from removing trolley wires and poles of the street railway company. A similar order asked recently by the Puget Sound Traction, Light & Power Company, was denied. Controversy over the right of the street railway company to occupy the streets with its poles and wires has existed for some time and a friendly suit was agreed upon to test the question. Within a day after the bringing of the suit the council revoked the franchise of the company despite an agreement with the trustee for the bonds that the franchises would not be interfered with.

SACRAMENTO, CAL.—The visit to this city last week of officials of the Central California Traction Company, and San Francisco capitalists, has started a rumor in railroad circles

that some sort of a deal is being contemplated with the company. It is said there is possibility of the Southern Pacific Company taking over the line. This theory is strengthened by the fact that in the party was Paul Shoup, who has charge of the Southern Pacific electric roads in California. Others in the party were Herbert Fleishhacker, one of the principal owners of the traction company; General Manager C. H. Robertson, S. C. Johnson, H. Webster and Alex. L. Ehrman. Geo. W. Peltier, vice-president of the California National Bank, and one of the officers of the traction company, is quoted as saying that the visitors were merely visiting Sacramento on a pleasure trip.

TELEPHONE AND TELEGRAPH.

SAN FRANCISCO, CAL.—City officials are arranging with the telephone company for a central station in the new city hall.

SAN FERNANDO, CAL.—Work will start soon on a building for the San Fernando Telephone & Telegraph Company to be erected on Maclay avenue.

SPOKANE, WASH.—The Pacific Telephone & Telegraph Company has been granted a franchise to lay underground conduits with all necessary equipments for telephone service.

WATERWORKS.

BILLINGS, MONT.—The Valley Creek flume of the Big Ditch Company, west of Park City, will immediately be replaced by a reinforced concrete siphon. The cost is estimated at $7500.

HAILEY, IDAHO.—On November 10 an election will be held here on a bond issue of $35,000 for the purpose of purchasing the waterworks system owned by the Idaho State Life Insurance Company.

RED LODGE, MONT.—The city council has voted to repudiate the contract entered into last spring for the sale of the $30,000 issue of waterworks bonds to White, Grubbs & Company of St. Paul.

GREENVILLE, CAL.—The 200 men who were employed by the Great Western Power Company, on the Canyon Dam, at Nevis, have been discharged. The big barrier has been completed, and only an operating crew is being held there.

BILLINGS, MONT.—A possible solution of the local water bond problem, which may result in the immediate floating of the $450,000 issue, has been proposed to Mayor Leavens and if the plan is legal the bonds will be floated at once.

SAN DIEGO, CAL.—Specifications for the construction of a filtration house and tanks on the lower Otay dam have been filed with the city council. Bids will be advertised in a few days. The sum of $60,000 was set aside in the water bond issue for this plant.

SAN DIEGO, CAL.—With the council's sanction Superintendent R. R. Fay will proceed to carry out all improvements to the water system contemplated, including the installation of the Bonita pipe line and the La Mesa line to connect the Cuyamaca system with that of the city.

OAKLAND, CAL.—It is reported that the validity of the Spring Valley Water Company's claim to the waters of the Calaveras and Sunol district is about to be attacked in the courts of the State by the landowners of that large area along the banks of Alameda Creek known as "the Niles cone."

PASADENA, CAL.—At the request of Commissioner Salisbury of the department of public utilities, Chief Engineer Morris of the municipal water works has outlined a plan for the improvement of a distribution system on several streets that are about to be paved. Four and six inch mains will be laid.

LOS ANGELES, CAL.—Wm. Mulholland's plan for the immediate construction of the Chatsworth-San Fernando line of conduit has been approved by the water board. The line will carry aqueduct water from the San Fernando dam to the proposed Chatsworth reservoir, a distance of 45,000 feet, at an estimated cost of $7 per foot.

CALEXICO, CAL.—Only one bid was received for the construction of a filter bed and it was rejected, as it did not include a cleaning system. H. W. Blaisdell, patentee of the filter cleaner in use at Yuma, failed to hand in a sealed bid, though he made a verbal bid of $11,000 to the city trustees some time ago.

SAN DIEGO, CAL.—L. L. Boone, claimant of water flowing into San Diego River near Cape Horn, has offered to sell lands in the El Monte Rancho, west of what is known as Cape Horn, on the south bank of the San Diego River, about 5 miles up stream from the railroad bridge at Lakeside. The lands are water bearing, and a fine dam site is located on them. It is estimated a dam could be built for $66,000 and a steel pipe line with a capacity of 10,000,000 gallons daily could be built for $290,400.

LOS ANGELES, CAL.—Jos. B. Lippincott, consulting engineer, has submitted a preliminary report to landholders of Victor valley and members of the Victor Valley Mutual Water and Power District Association. Lippincott now has a corps of surveyors at work in Victor valley getting figures on the amount of land that can be formed into this irrigation district with water available. When the survey is complete figures will be submitted to the reclamation bureau to determine whether or not the project is feasible.

LOS ANGELES, CAL.—The board of public service commissioners have laid down a program for the extension of the municipal water system into territory now served by Union Hollywood Company. The district to receive city water first is that between Western and Vermont avenues and Temple street and Wilshire boulevard. The new plans indicate the paralleling of private mains and will extend all over Hollywood district. The invasion of that territory may result in the resumption of negotiations for the sale of the Union Hollywood Water Company's system to the city.

SAN FRANCISCO, CAL.—Percy V. Long, City Attorney, and A. T. Vogelsang, Supervisor, addressed the members of the Down Town Association at their last weekly luncheon, explaining the plan under which the city officials hope to be authorized to purchase the properties of the Spring Valley Water Company at a price of $34,500,000, thus obviating the necessity for long and expensive condemnation proceedings. Long said that it was absolutely essential to the successful carrying out of the city's plan of municipal ownership and operation of its water system that the Spring Valley reservoir sites be acquired, since they are the only ones available, and reservoirs will be necessary to store water for emergencies even after the completion of the Hetch-Hetchy system. The acquisition of the Spring Valley system, he said, would enable the city to develop the Hetch-Hetchy supply consistently, and only as needed, distributing the cost of construction over many years and saving in bond interest the larger part of the cost of the Spring Valley system. The only item in the price agreed upon by the city officials and the company which is questioned by the opponents of the purchase, he declared, is an allowance of $2,500,000 above the actual value of the physical properties for "going concern" valuation. That the courts would certainly allow as much as this in condemnation proceedings was, he said, assured by recent ruling of the U. S. Supreme Court. Supervisor Vogelsang declared that the proposal was the fairest the city had yet received for the purchase of Spring Valley, the city being required to purchase only such land as was water-producing. He said that the 68,000 acres which the city would acquire constitute a territory three times the size of the total area of the city and county of San Francisco. Speakers chosen from the opponents of the proposed purchase will present their arguments to the downtown business men at their luncheon next Wednesday.